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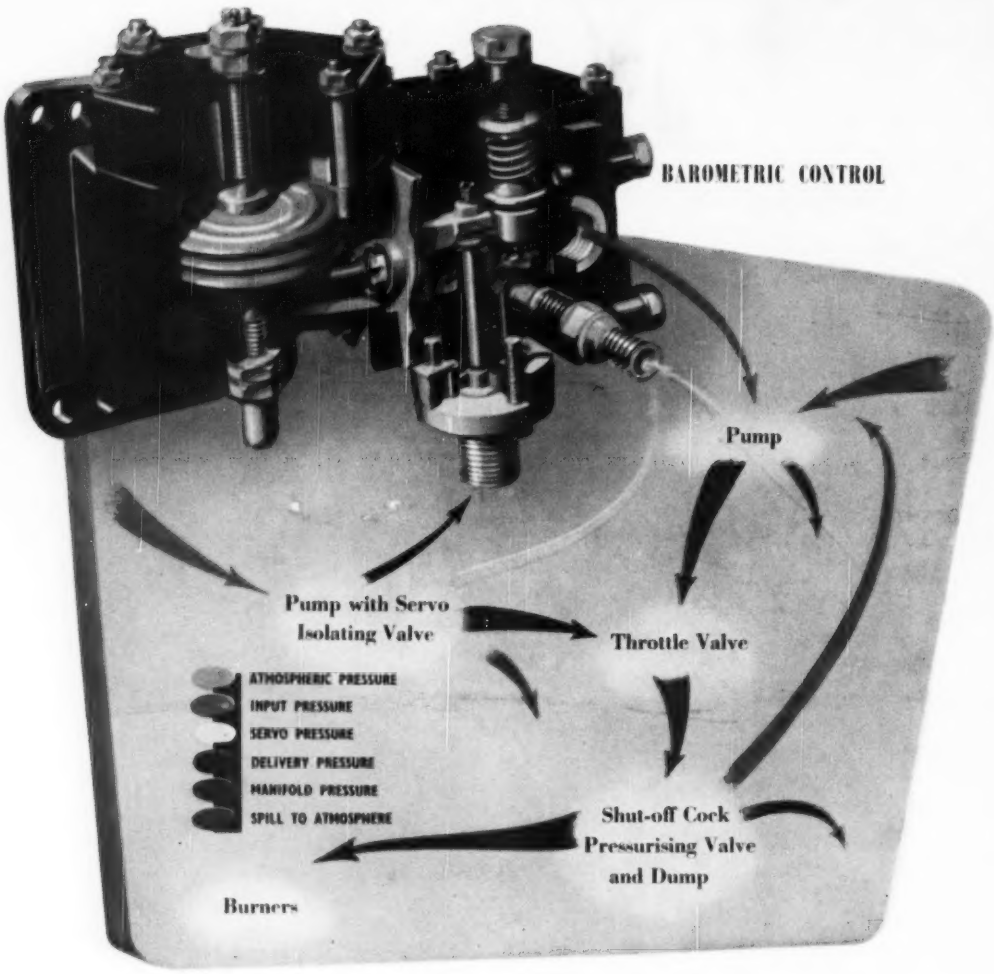

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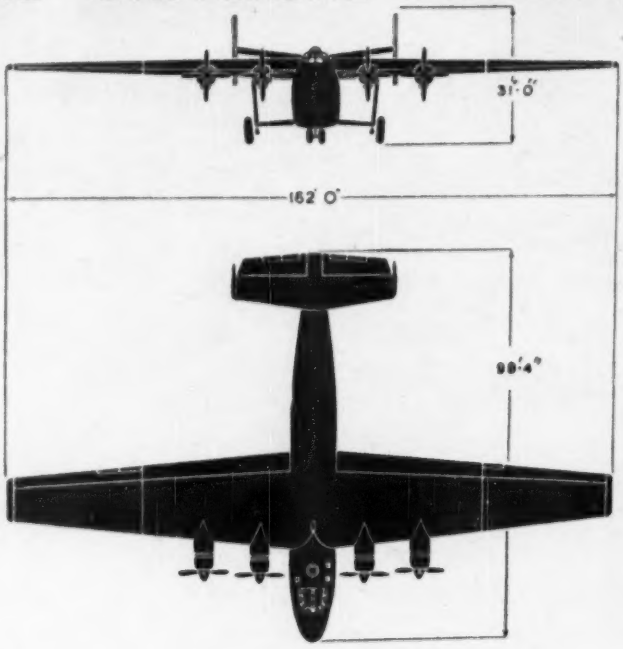

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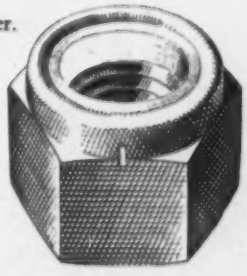

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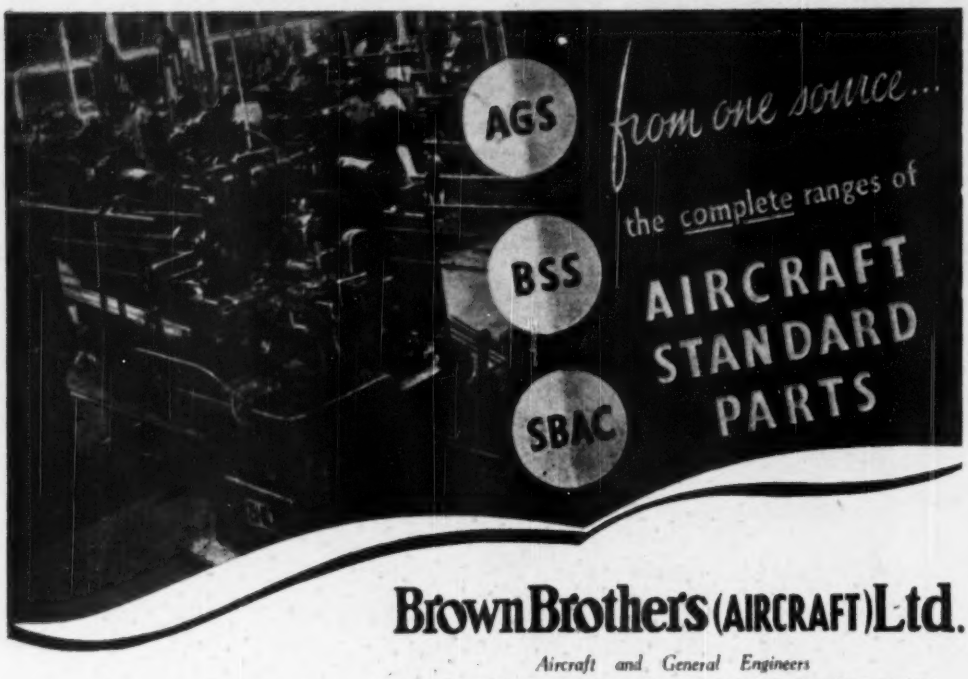

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In this issue:

Aerial Advertising - - 186
Livingstone Airport Opened - - - - - 188
Hydraulics - - - - - 191
Shooting Stars in Korea - 197
Seafarers - - - - - 198
The Versatile B-29 - - 202

Air Commerce Shows the Way

THE recent turn of international events renders the present an appropriate time for a stocktaking of post-war aviation. Such an examination discloses that while in the military field the state of air power among the Free Nations gives no ground for complacency (rather, in some respects, is there cause for real concern) civil flying shows up in a far happier light.

Although from the political and economic viewpoints the scene could hardly have been less favourable, the degree of achievement represented by current developments in commercial flying is truly remarkable. In the short span of ten years we have seen airliners grow to over a hundred tons in weight, while operational cruising speeds have steadily risen from 150 to some 300 m.p.h. Pressurized cabins now permit flight in hitherto unimagined comfort at levels high above the hazards and discomforts of treacherous weather; the introduction of turbine-powered airliners is imminent; and new radar and blind-flying systems have been perfected. All these factors, and the revolutionary designs for airport terminals now in hand, justify high hope for the next decade.

The vast technical improvements within the last year or two have brought about an astonishing increase in the volume of airline business, conservatively estimated now at six times its pre-war level. Filling the transport vacuum which followed in the wake of war, considerably more than two hundred airlines were, by 1948, operating an unduplicated route network of more than one million miles. The growth to date represents a payload increase of more than one-half during each successive post-war year.

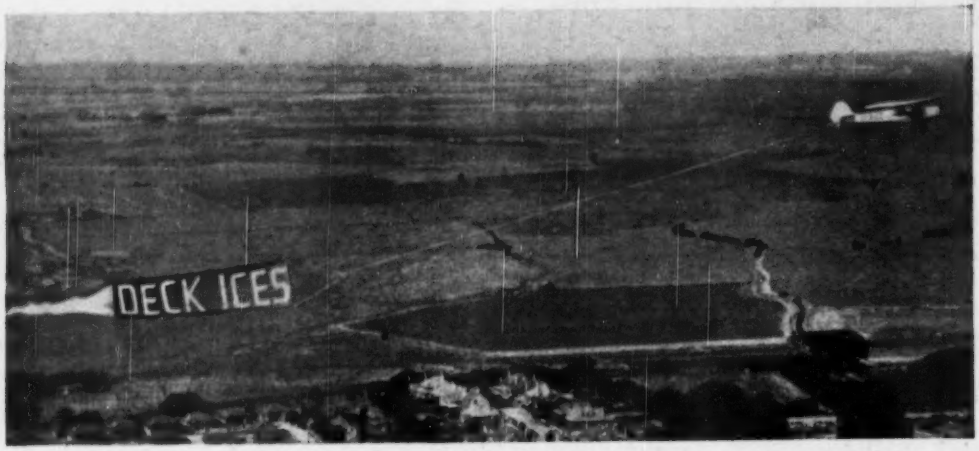
By the nature of its transport industry, America has enjoyed the lion's share of this advance, and in 1949 the airlines of the U.S.A. made a record profit of almost £16 million—an increase of 39 per cent on the figure of the previous year. In Britain, although it is still far from profitable, the air-transport business is now developing at an encouraging rate, while throughout the rest of the world widespread optimism is entertained for the bountiful years now clearly seen "around the corner."

Round the Table

Not only in material results is this progress notable: equally remarkable is the atmosphere in which the results have been achieved. In international operations there has been a significant absence of power politics, cut-throat practices, and double dealing. Most of the problems—and they have been diverse and intricate—were resolved in approved "round-table" fashion. The valuable work of I.C.A.O. and I.A.T.A., embracing virtually every aspect of commercial aviation, has been especially commendable. As an example of I.A.T.A.'s efficiency the speedy solution of the complex world-fare problems attending last year's devaluation comes readily to mind. Worthy contributions to air safety have been forthcoming from I.C.A.O. and the recent improvement in the accident rates for civil aircraft of all countries is due in large measure to the uniformity in international safety standards for which this body is constantly striving.

Air travel has ceased to be an adventure. Throughout the world it is regarded no longer as a novel facility but as an absolute necessity, a generous portion of which no progressive nation can afford to be without. Commercial flying has been its own salesman, and its prosperity is, perhaps, primarily attributable to the guiding principle of co-operation between air crews, operators, and the governments of many nations.

If the improved status now enjoyed by practically every airline in the world is any yardstick, it would seem that such precepts are well worthy of adoption in other spheres of human activity. In civil flying, at least, there is little cause for reproach. The right road has undoubtedly been chosen and the way ahead promises easier going.



A photograph taken last month : Air Kruise (Kent), Ltd., claim to be the first operators to resume banner-towing since the war. The banner flown by the Auster is of the simple small streamer type : a larger-scale "silhouette" method is described in this article.

AERIAL ADVERTISING

Banner-towing and How it is Done : Some Recollections of Pre-war Methods

By H. J. COOPER

AIRCRAFT towing advertisement banners were a frequent sight in pre-war days over numerous cities and seaside towns, although this kind of flying, like most other forms of civil aviation ceased when war was declared in September, 1939. But at that time legislation was in fact under way to prohibit aerial advertising, and the ban was to come into effect officially on October 1st, 1941.

In about 1936-37 many letters appeared in the technical and lay Press complaining of the "pestilential nuisance" of low-flying aircraft carrying banners and making far too much noise. These machines were mostly of the Avro 504N type, a Lynx- or Mongoose-engined development of the famous 504K seen at the R.A.F. Display at Farnborough in July. These old biplanes certainly did make a racket, but the argument against the noise they caused could not justifiably be put forward today. A B.E.A. Viking makes considerably more row, and there are far more of them over London than ever there were Avros. Today, joy-flying Rapides from London and Northolt Airports add to the sky sounds—when one can hear them above the sound of road traffic.

From time to time there has been an outcry from the public against low-flying aircraft, whether carrying banners or not. With some justification, many protests were also made (to the Air Ministry, the Police and the papers) that the Avros with their trailing banners flew far too low for safety. Indeed, they were reported by competent observers to have been seen at a height of 800 to 1,000ft above London, and in the event of an engine failure would certainly have had a sticky time in getting down, with serious results for both the pilot and the populace. The Avro was a safe, reliable and manœuvrable aircraft (as those who remember the Cobham Air Displays will agree) but its performance was, understandably, seriously reduced by the drag of two large canvas banners, 12ft wide by 60ft long, attached horizontally under the lower wings. As a matter of fact, pilots who flew these Avros said that when carrying the banners the best height they could attain was a little more than 1,000 ft. Some pilots flying them along the south coast had to keep out to sea because they could not climb over the cliffs!

So quickly do the years pass that the spectacle of an aircraft towing an advertisement banner may be unknown to our younger readers; and there are indications that older people, interested from a business viewpoint, are in search of information. In this article, one of the most efficient methods used just before the war is described in detail.

Now that petrol rationing has ended, banner-towing is beginning again, as the heading picture shows. In pre-war days the practice met with some public opposition, not only on account of aircraft noise, but because (in the words of one objector) "it disfigures the sky, the only place so far unsullied by hoardings." Had the war not intervened, prohibition might have followed. Another common form of aerial advertising before 1939 was sky-writing in smoke, and it has been semi-seriously suggested that it might now be economically revived by high-flying aircraft tracing letters in condensation-trails.

Presentation of this article on its merits as a technical analysis of an unusual aspect of flying activity must not be taken as an indication that "Flight" advocates the general re-adoption of aerial advertising.

Another argument put forward was that banner-towing aircraft diverted the attention of motorists to the sky instead of the road—but it is significant that the A.A. frequently made use of this form of announcement, exhorting road-users to "Give way and be safe."

In 1938 Mr. A. P. (now Sir Alan) Herbert, M.P., promoted a Bill in Parliament "to prohibit the exhibition of advertisements by aircraft." In the following year the Committee on the Control of Flying recommended that such advertising should be prohibited and the Government declared its intention of "bringing the nuisance to an end."

But the war intervened and the Bill never went through. After 1945 petrol rationing did not permit the idea to be resumed, but as that restriction is no longer applicable, and subject to aircraft and pilots complying with the various civil aviation requirements, aerial advertising may now be practised. It is only necessary for the towing gear to be approved by the Air Registration Board, for the normal flight rules and orders to be observed, and for the pilot to have a Commercial Pilot's Licence. This form of flying counts as "aerial work" and may not be practised

by the holder of a Private Pilot's Licence except in a case where there is no question of "hire and reward" flying.

Just before the outbreak of war, "banner-flying," with horizontal banners attached to rollers below the lower wings, was beginning to give way to the vertical advertisement, which for purposes of discrimination may be termed "poster-towing." The latter consisted of a word or message being trailed behind the tail of an aircraft on a long cable, the letters being cut out and readable over a much wider area than was possible with the horizontal banners, which could only be read when the machine passed immediately over an observer.

One of the firms specializing in poster-towing was Air Publicity, Ltd., and they developed their own method of operation. A description of this method, as it may be applied today, follows.

The poster itself consists of block letters, 6 ft high, cut out from canvas, preferably black. A length of bamboo, of 1¼-in diameter, is inserted into the leading edge of each letter to act as a stiffener. Connecting tapes run horizontally across the backs of the letters, with clips on the leading edges and hooks on the trailing edges, so that other letters may be connected to them as required. These tapes are not visible from the ground when the poster is 200 ft up, and the message is readable for about a mile to the left of the poster. From the other side, of course, the message appears backwards, but it was customary for the towing aircraft to make a wide left-hand circuit round a town so that the message could be read by as many people as possible. Up to 30 letters can be used to form one poster.

When all the letters are clipped together in the desired order the poster is rolled up until required. Assembly or taking-down of a complete poster can be effected in under an hour.

At the forward end of the poster is a vertical metal rod, or tow-bar. At its lower end is a small adjustable fin to ensure that the poster is kept vertical in flight, and the bar itself is weighted at the bottom.

The Avros were fitted with a vertical box structure under the fuselage just aft of the tail-skid. At the bottom of this was the release-gear (operated by a Bowden cable from the cockpit, in much the same way as the present method used for glider-release) to which was attached the 500-ft tow-rope. The rope itself is strong enough to take an 880-lb strain. The other end of the tow-rope is attached to an "8" hook, which allows the poster to ride easily, and the hook is in turn connected to a bridle consisting of three ropes (the lower of which is arranged to take the greatest strain) joined on to the tow-bar. The various components are shown in the detail drawing. At the extreme end of the poster is a piece of heavy-gauge netting to prevent oscillation and consequent damage to the poster.

The method of picking up the poster from the ground is shown in the other sketch. The complete poster is laid out on the airfield, well to the left of the aircraft, and the tow-rope looped round and attached to the quick-release gear under the fuselage. The aircraft illustrated in both drawings is the Chrislea Ace, which, with its tail-up attitude on the ground, might prove suitable for this sort of work. It is low-powered (145 h.p. Gipsy Major) and economical to operate, which are important considerations. In practice the aircraft is much farther behind the poster for the start of the take-off run, but is shown closer in the drawing for convenience. The top of the tow-bar is held up from the ground by an assistant to facilitate the pick-up. The poster is, in fact, peeled off the ground. There is no jerk when it is airborne, so there is little likelihood of its being damaged.

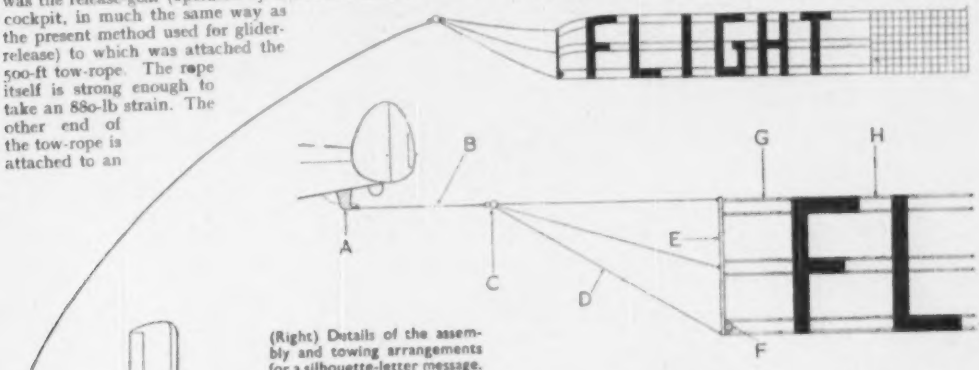
The pilot climbs steeply immediately after take-off, and when 1,000ft has been reached assumes level flight and a suitable cruising speed. The Avros were cruised at about 50-60 m.p.h. with the posters, but a higher speed should be possible with a modern aircraft; obviously, the poster will become tattered if flown too quickly.

To see that the poster is flying correctly the pilot must make a gentle turn, for it is immediately behind and below—in the "blind spot" in fact—when flying straight. If it is not flying vertically the pilot can make a complete turn round the airfield and drop the poster by means of the release-gear so that the fin on the tow-bar can be adjusted.

At the end of the display the poster has to be dropped back on to the airfield as, obviously, the aircraft cannot land with it still trailing behind. To do this the pilot flies at about 400ft into wind and, after getting permission from flying control, releases the cable at the right time so that the poster falls in the required place. It is a matter of judgment and experience for the pilot, making full allowance for wind, to know just when to release the cable. If dropped from less than 400ft there is the possibility that the tail-end of the poster may hit the ground before the cable is released and become damaged.

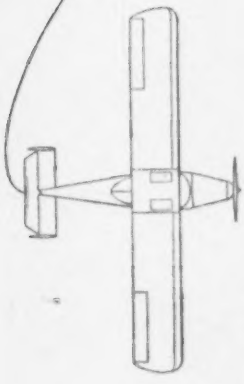
Air Publicity used to have a van equipped with many sets of letters, and spares for the aircraft, to accompany each of their Avros on its tours round the country. Each operational crew consisted of a pilot, a ground engineer for servicing, and a van driver/maintenance man to attend to the poster.

It is perhaps important for poster-towing pilots to remember that over a town an aircraft may not be flown lower than 1,000ft above the top of the highest obstacle within a radius of 2,000ft of the aircraft. Finally, the possibility of a total ban must be borne in mind.



(Right) Details of the assembly and towing arrangements for a silhouette-letter message.

A — Release gear.
B — Tow-rope.
C — "8" hook.
D — Bridle.
E — Tow-bar.
F — Stabilizing fin.
G — Connecting tapes.
H — Hooks and clips.



(Left) A plan view showing how the message is "peeled-off" the airfield; the tow-bar is raised at one end to facilitate the pick-up. The word depicted does not foreshadow *Flight*'s use of this publicity method!

LIVINGSTONE AIRPORT OPENED

—by Lord Pakenham : A Brilliant Ceremony

As forecast in *Flight* last week, when we published a photogravure feature illustrating the location and layout of the magnificent new £1 million airport at Livingstone, Northern Rhodesia, the opening ceremony was duly performed by Lord Pakenham, Minister of Civil Aviation, on Saturday last, August 12th.

The spectacle was a brilliant one, the duck-egg-blue buildings in the dazzling sunshine forming a background for a great crowd of appropriately dressed white people and some thousands of gaudily attired natives, many of whom had trekked from remote villages, led by their paramount chief.

Lord Pakenham praised the great enterprise of the Northern Rhodesia Government and reminded his audience that B.O.A.C. would soon be using the new airport as a stop on their Hermes route between London and Johannesburg. He welcomed Sir Miles Thomas, chairman of B.O.A.C., who referred to Rhodesia's increasing strategic and economic importance, in which the new airport would be a vital link and a big dollar-earning tourist attraction. [It is so near the Victoria Falls that the spray can be seen from the control tower.] In 1952, said Sir Miles, the D.H. Comet would also be calling there; it would fly from London to Johannesburg in 22½ hours, which will include 5½ hours on the ground.

Lord Pakenham performed the ceremony in the presence of H.E. the Acting Governor, Mr. R. C. S. Stanley, C.M.G., O.B.E., who read messages from the Governor, Sir Gilbert Rennie, who is on leave in Britain, from the Transport Minister of South Africa and from the Governor of Southern Rhodesia.

The inaugural flying display which followed caused immense interest; many of the spectators had never seen a jet aircraft, so it can be imagined that a fine exhibition of formation aerobatics by four S.A.A.F. Vampire pilots (shortly to leave for Korea) caused something of a sensation. Among the outstanding demonstrations of civil aircraft were those by Capt. J. J. Veasey in the B.O.A.C. Hermes IV *Hangist*, by F/L. D. J. Broomfield, Handley Page test pilot, and by a Constellation.

From the Livingstone ceremony Lord Pakenham went on to Pretoria for talks with South African transport officials before returning to England in a Skymaster of South African Airways.

The Editor of *Flight* flew out to the opening in the Hermes, and his impressions of the historic ceremony will appear in a forthcoming issue.

AIR RACING NEXT SATURDAY

Kemsley Trophy Race in South Wales

NEXT Saturday, August 19th, another event in the National Air Races series will take place, this time at Fairwood Common Airfield, Swansea, where the Swansea and District Flying Club is co-operating with the R.Ae.C. in staging the Kemsley Challenge Trophy Race.

Eight entries have been accepted, the pilots and aircraft being: C. J. de Vere (Hawke Trainer), D. C. Jemmett (Hawk Trainer), F. Dunkerley (Gemini), S/L. W. I. Lashbrook (Proctor), J. N. Somers (Gemini, Gipsy Majors), C. G. Alington (Sparrowhawk), Lt. Col. D. S. Fanali (Fiat G-46), and S/L. Neville Duke (Hurricane).

The Trophy, first awarded at Elmdon last year, was presented by Viscount Kemsley. With the Trophy is a first prize of £100. The second prize is £75 and the third £50. A sum of £50 will be awarded to the pilot making the best time over the course.

The race is open to aircraft of any nationality with a minimum sea-level speed of 140 m.p.h. The course is a seven-sided circuit of 28 miles round the Gower Peninsula and will be lapped three times, making a total distance of 84 miles. The start and finish are at Fairwood Common, with turning points at Salthouse Point (Llanmorlais), Whiteford Point, Burry Holms, Rhossili (Kitchen Corner), Port Eynon Point, and Oxwich Point.

Last year's winner, Neville Duke, will fly the Hawker Hurricane (No. 41) which was second in the King's Cup Race.

To support the race a full-scale air display is being held, with a programme of ten events including an exhibition by the famous Patrouille d'Etampes of the French Air Force. The main display programme begins at 2.30 p.m., and the race takes place at 3.45. Admission is 2s 6d (children 1s).

The final event of the National series takes place at Baginton, Coventry, on September 2nd, when the Siddeley Challenge Trophy (ten entries) will be flown; after that the *Daily Express* South Coast Race on September 15th will bring the 1950 air-racing season to a close.

FUEL FOR THE FUTURE

FOR the past 29 years the Anglo-American Oil Co. have had a refinery at Fawley, on the western shore of Southampton Water, and this establishment, covering something over 200 acres, has an output of 900,000 tons a year. Since August last year, however, work has been going forward at a phenomenal rate on the construction of a new installation. Housed on an adjacent 450-acre site, the new plant will supplement, but remain a separate entity from, the existing refinery, and is designed to handle the enormous intake of 5,500,000 tons of crude oil per year. In other terms, this is equivalent to 110,000 barrels per day (1 ton = 7½ barrels, and 1 barrel = 40 gallons).

When completed, the new refinery will be exceeded in size only by a few of the very largest U.S. refineries and, of course, those at Abadan and Aruba, which are the largest in the world. It is the largest single refinery project in this country and Europe at the present time, and when in full operation will contribute approximately 25 per cent of the refining output of the United Kingdom. The scheduled date for completion of the project is January 1st, 1952, but it is possible that some parts of the plant will be in operation toward the end of 1951.

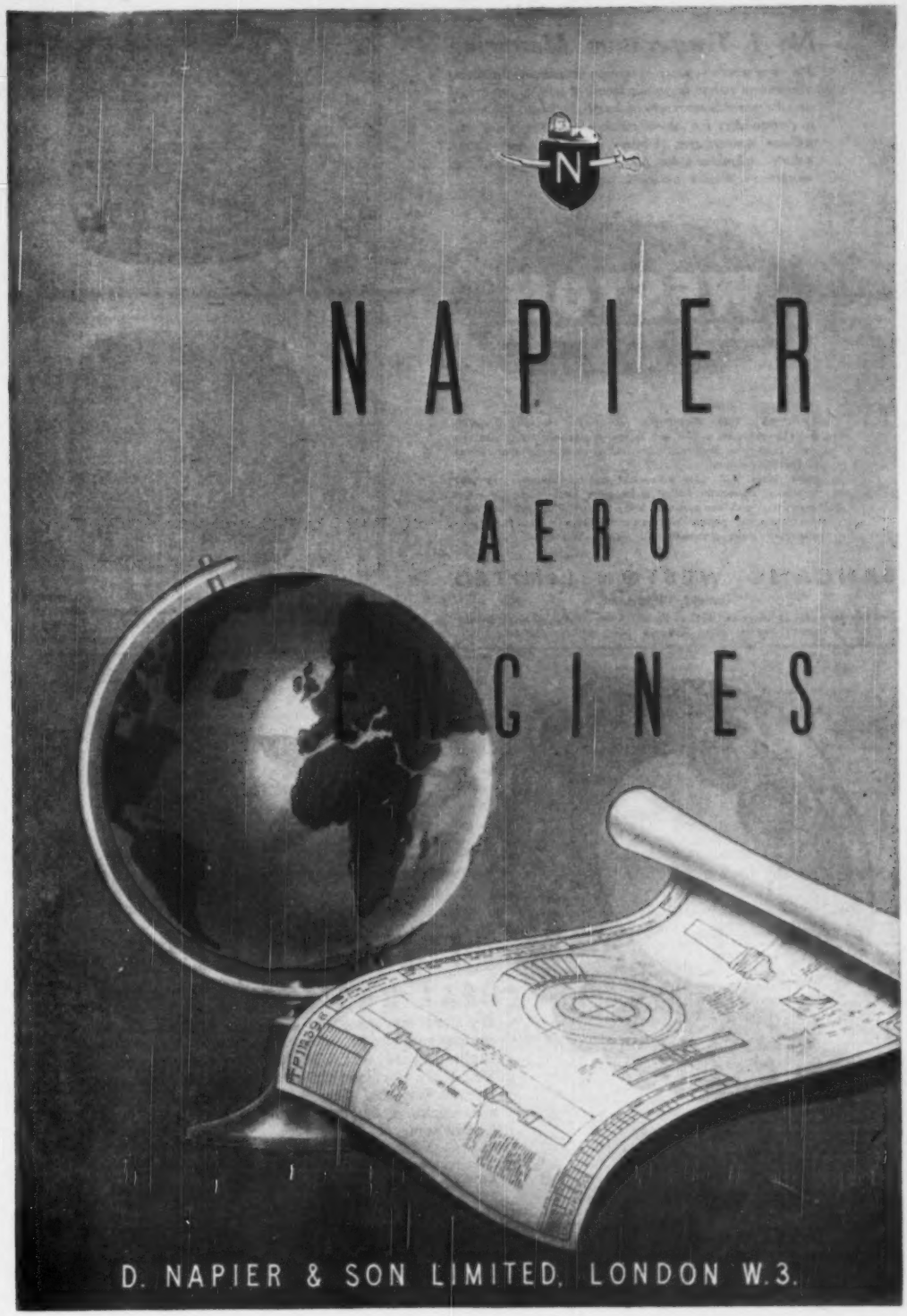
In the main, the output of the new refinery will be high-quality petroleum products, and in this connection, the catalytic cracking plant, which is now in process of construction, will have a production capacity of 1,000,000 gallons of petrol per day. This, too, is the approximate capacity of the Edelanau plant, the purpose of which is to improve the quality of the product.

The variety of final products which may be derived from the basic crude oil is very wide indeed, and runs the gamut from gases through solvents, petroleums, lubricating and processing oils, by way of soaps, salves and ointments, down to asphaltes, emulsifiers and the heaviest fuel oils. From a primary quantity of 100 gallons of crude oil, the product yield is approximately: petroleum, 37 gallons; fuel oil, 39 gallons; miscellaneous, 17 gallons; kerosene, 4.5 gallons; lubricants, 2.5 gallons. This breakdown is somewhat arbitrary, and from a given primary quantity of crude oil, the extraction of any one final product, e.g., aviation turbine fuel, can be increased, within certain practical limits, at the expense of its complementary derivatives.

NEW FORK-LIFT TRUCK

A RECENT demonstration near London of the first British fork-lift truck to be equipped with giant pneumatic tyres gave spectacular evidence of its ability to traverse both rough and soft ground while carrying heavy loads. The vehicle is the Matbro "Pneustac," built by Mathew Bros., Sandy Lane North, Wallington, Surrey, and at the demonstration it carried a bulk load measuring 7ft × 5ft × 6ft, and another load to its full capacity of 4,480 lb.

Motive power is either by a Perkins P.6 oil engine or a 36 h.p. Fordson petrol engine. The hoist and tilt are hydraulically operated, and the lifting height is 9ft. The gears give three forward speeds and reverse, and maximum speed is 15 m.p.h.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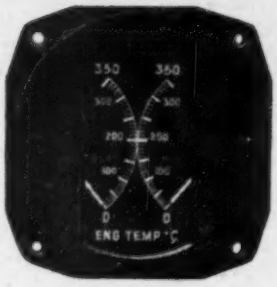

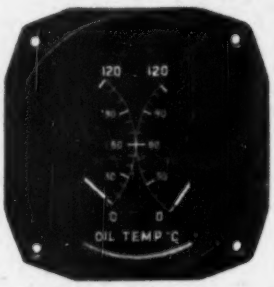

Illustrations show :
Above : Model 5128. Dual Engine Temperature indicator, comprising two Millivoltmeters of 100° scale housed in large-size S.A.E. case. For use in conjunction with copper/constantan, iron/constantan or chromel alumel thermocouples.
Below : Model 5127. Dual Ratiometer indicator, comprising two 100 Ratiometer movements housed in large-size S.A.E. case. For use in conjunction with thermometer bulbs, electrical oil pressure transmitters, electrical position indicators or any combination of two of these to indicate a variety of temperatures, pressures or positions.

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"Photograph by courtesy of the De Havilland Aircraft Company Limited"

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HERE and THERE

A Final Reminder

COMPLETED entry forms for the *Daily Express* international challenge trophy air race must reach the Royal Aero Club at 119, Piccadilly, London, W.1, by next Saturday (August 19th). No late entries will be allowed.

The race is to be held on September 16th, along a coastline course from Hurn, near Bournemouth, to Herne Bay, for prizes totalling £2,350.

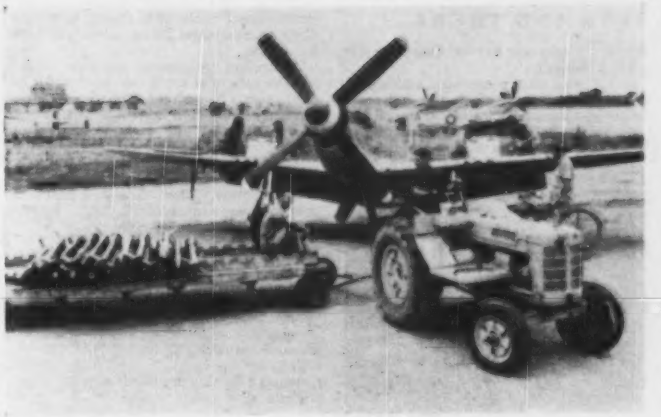
News from the Commonwealth

NEW ZEALAND'S Defence Minister, Mr. Macdonald, announced recently that Vampires, Devons, Freighters and Hastings had been ordered from Britain for the R.N.Z.A.F. The order was said to be subject to confirmation in the light of possible changes in the British supply position.

South Africa (which, as mentioned on p. 188, is sending a fighter force to Korea) has adopted a new roundel for its Air Force: a leaping springbok, in orange, in a blue circle.

Kaman's New Helicopter

THE U.S. Navy has ordered a number of HOK-1 four-seat liaison helicopters from the Kaman Aircraft Corporation, following a recent design competition. This new type has the same system of intermeshing rotors and servo-flap rotor controls employed on the smaller K-225 already in service with the U.S. Navy and Coastguard.



R.A.A.F. IN ACTION: On an airfield in Japan, Mustang 4s of the 77th Squadron, Royal Australian Air Force, are being re-armed with rocket projectiles for a strike against North Korean forces. News of U.S.A.F. operations in the same theatre—with Shooting Stars—appears on page 197 of this issue.

Red-letter Day

JANUARY 1st, 19— has been fixed as the day on which the R.A.F. will introduce the new trade structure, described in *Flight* of August 3rd. The reorganization will greatly improve the present system of employing and promoting ground tradesmen, particularly technicians.

G/C. Wheeler Promoted

PROMOTION to Air Commodore, and a new appointment as A.O.C., Cyprus, are announced for G/C. A. H. Wheeler, O.B.E., who has been in charge of experimental flying at the R.A.E., Farnborough, for the past 20 months. During two tours of duty at Farnborough A.Cdre. Wheeler flew every aircraft sent there for testing and has over 200 types in his log book.

He is a trustee of the Shuttleworth Remembrance Trust, which maintains a collection of veteran aircraft. His performance with the Sopwith Pup during the recent R.A.F. Display will be remembered by visitors to Farnborough on that occasion. An enthusiastic private pilot, A.Cdre. Wheeler flew his Auster into third place in this year's King's Cup.

Dutch Balloon Race

SOME 15 to 25 entries are expected in the *Grand Prix d'Aérostation des Pays-Bas*—an international balloon race to be held at Amsterdam on September 2nd. Among the aeronauts taking part will be M. Cormier, a 75-year-old Paris tailor, who has held the balloon long-distance record for 25 years. Prizes include a complete balloon and £1,000.

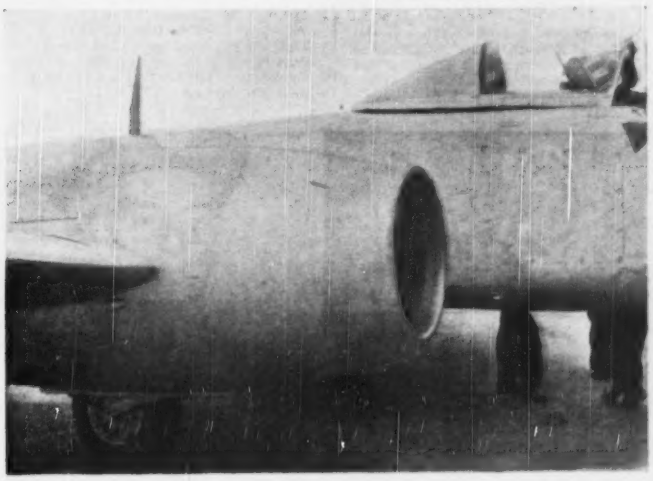
Modellers' Mecca

SUPERB craftsmanship in all branches of model aviation may be seen among the exhibits at the 25th Model Engineer Exhibition at the New Horticultural Hall, London, S.W.1, which closes next Saturday, August 19th. In the exhibition hall, pride of place is given to the glossy cream Saunders-Roe Princess scale model shown at Farnborough last year.

Interesting stands are displayed by the R.A.F., the Society of Model Aeronautical Engineers the Low Speed Aerodynamics Association and the Department of Scientific Research, N.P.L. . . . Sir Frank Whittle has lent a model of the W.2/700 turbojet and there are sections for several firms, societies, clubs and private exhibitors. The exhibition is open daily from 11 a.m. to 9 p.m.

Derwents on the Clyde

FOUR Rolls-Royce Derwents power the hull of a 224-ton former paddle-steamer, the *Lucy Ashton*, which is being operated on the Clyde by the British Shipbuilding Research Association. The vessel is employed in tests to measure hull-resistance. Turbojets are particularly suitable for the purpose, since they propel the ship at speed without influenc-

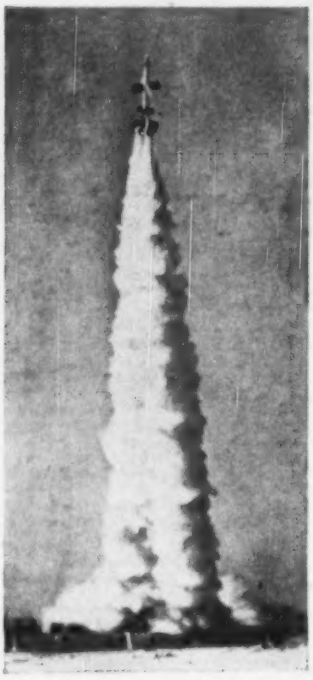


BREATHING SPACE: Larger air intakes for the Rolls-Royce Derwent 5 turbojets characterize this experimental Gloster Meteor 8. It is being flown on comparative trials with a standard aircraft to accumulate performance and intake-efficiency data under varying conditions. An improved rate of climb may be expected.

HERE AND THERE . . .

ing in any way the natural flow of water around the hull.

The Derwents are mounted amidships, in pairs, on a gantry across the deck, and handling characteristics of the vessel are reported to be excellent. Undoubtedly, the *Lucy Ashton* must be the noisiest ship ever launched.



. . . AND RETIRE IMMEDIATELY: Impressive vertical take-off by a Fairchild Lark surface-to-air guided missile—a type now being produced in quantity for the U.S. Navy and Air Force. Advanced guidance equipment has been incorporated in the design, which was originally conceived, in 1945, as an anti-shipping weapon for use against the Japanese.

Quick on the Uptake

ONE of the most astonishing performances at last year's S.B.A.C. Show was given by the rapid-climbing experimental Gloster Meteor equipped with Rolls-Royce Avon turbojets. This test-bed aircraft, it was revealed, could climb to 40,000 ft in just over four minutes. The same aircraft, according to a recent S.B.A.C. statement, can now reach the same height in a little under three minutes—over three times as fast as the standard Derwent-equipped Meteor 4 (which has itself been aptly labelled "homesick angel").

P.1081 Production

A PRESS release issued on behalf of Hawker Aircraft, Ltd., implies that the new swept-wing P.1081 is the fastest fighter in the world; it also states that the P.1081 will be built in Britain. Performance trials, it is stated, will take place at Boscombe Down within the next few weeks.

Australian technicians are now studying design and construction of the P.1081 at Hawker's Kingston-on-Thames factory. Recently completed negotiations between the British company and the Australian Department of Supply will permit the aircraft to be produced under licence by the Commonwealth Aircraft Corporation, of New South Wales. The first batch of drawings has already been dispatched to Australia.

Two Million Miles

CAPTAIN T. W. Hoyle, of B.O.A.C. No. 3 Line, Bristol, recently completed 2,000,000 miles' flying. Born in 1908, he joined the R.A.F. in 1929 and served as a pilot for five years. In 1934, he joined Aircraft Distributors, Ltd., of London, and later that year entered Imperial Airways as a first officer. Capt. Hoyle served in the Middle East and India from 1934-46 and, more recently, flew Constellations on the England-Australia route.

NEWS IN BRIEF

THE equipment of the Vickers Viscount, which is now flying scheduled services on B.E.A. routes, and 28 of which are on order, includes a Sperry Gyrosyn C.L.2 compass and electric gyro horizon of the same make.

* * *

Mr. George Anderson has been placed in charge of foreign sales and publicity at Hawker Aircraft, Ltd. He has been with the company since 1940, when he joined them on Air Ministry equipment-liaison. Latterly, he has been assistant to Mr. William Humble, recently appointed Hawker Siddeley Group executive for the Near East and Pakistan.

* * *

Further to a recent reference in these pages, it should be made clear that the chief test pilot of Blackburn and General Aircraft, Ltd., is F/L. Harold ("Timber") Wood.

* * *

A new booklet from Surridge's Patents, Ltd., Croydon Road, Beckenham, Kent, gives details of the characteristics of an extensive range of industrial adhesives, mainly based on natural and synthetic rubbers. Of particular interest to the aircraft industry is "Titebond," which will bond a wide variety of materials, including polished aluminium to polished aluminium; also described are "G.P." cements for bonding rubber to metal.

* * *

A 16-page catalogue has been produced by W. Edwards and Co. (London), Ltd., Worsley Bridge Road, Lower Sydenham, London, S.E.26, illustrating the numerous high-vacuum products (pumps, gauges and associated equipment) manufactured by the company.

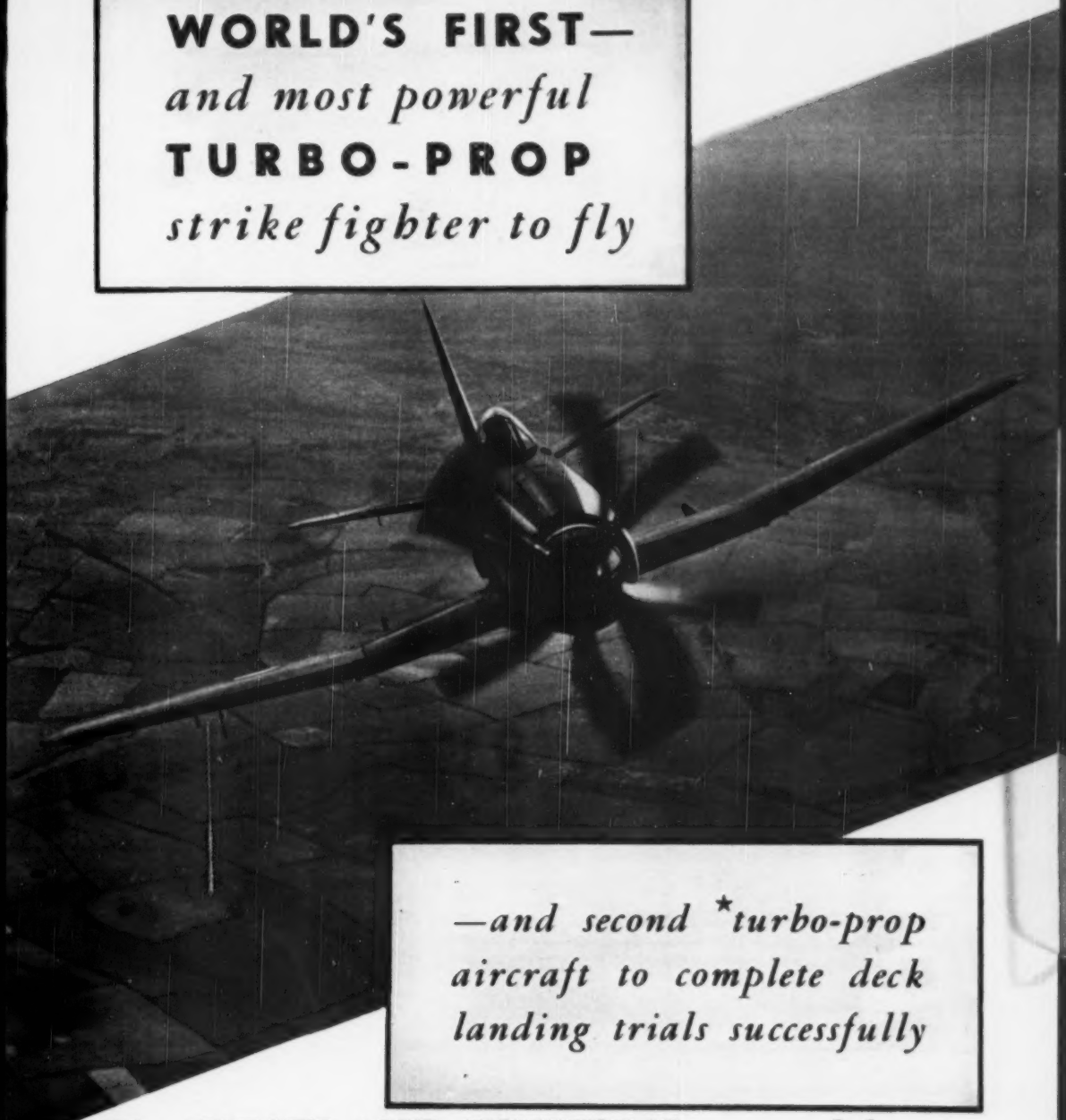
A slight reduction in the number of pages in "Flight," and some delay in reporting events, continue to be unavoidable as a result of the withdrawal of overtime working by a section of the printing industry.

NEW POST: Mr. Percy Davy, O.B.E., who, as reported last week, has been appointed to represent the Hawker-Siddeley Group in India. He was formerly Deputy Director-General of Civil Aviation there.

Several staff changes in the A. V. Roe organization are announced. The general works manager, Mr. F. V. Smith, O.B.E., is severing his connection with the aircraft industry in order to devote his full attention to other business interests, and his duties will be taken over by Mr. C. L. Hatton, works manager. Mr. Hatton was previously manager at Woodford Airfield, and his responsibilities will be assumed by Mr. L. Bailey as works superintendent. Mr. F. C. Langton has been appointed superintendent in charge of repair and servicing at Bracebridge Heath, Lincoln and Langar, near Nottingham.

SYMBOL OF UNITY: Cpl. H. Wilson of No. 426 Squadron, R.C.A.F., applies the United Nations badge to one of the North Stars now supporting U.N.O. forces in Korea. (Right) Commanding Officer of the Squadron—of which news is given on page 208—is W.C. C. H. Hussells, D.S.O., D.F.C., an ex-pathfinder.

WORLD'S FIRST—
and most powerful
TURBO-PROP
strike fighter to fly



—and second ★turbo-prop aircraft to complete deck landing trials successfully

The WESTLAND WYVERN powered by an

ARMSTRONG SIDDELEY **PYTHON**
TURBO-PROP

★ The first turbo-prop aircraft successfully to complete deck landing trials was the Fairey 17 strike fighter, powered by an Armstrong Siddeley Double Mamba.

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and baggage at a direct operating cost,
at an annual utilisation of 1,500 hours,
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AIRCRAFT ENGINES PROPELLERS

HYDRAULICS

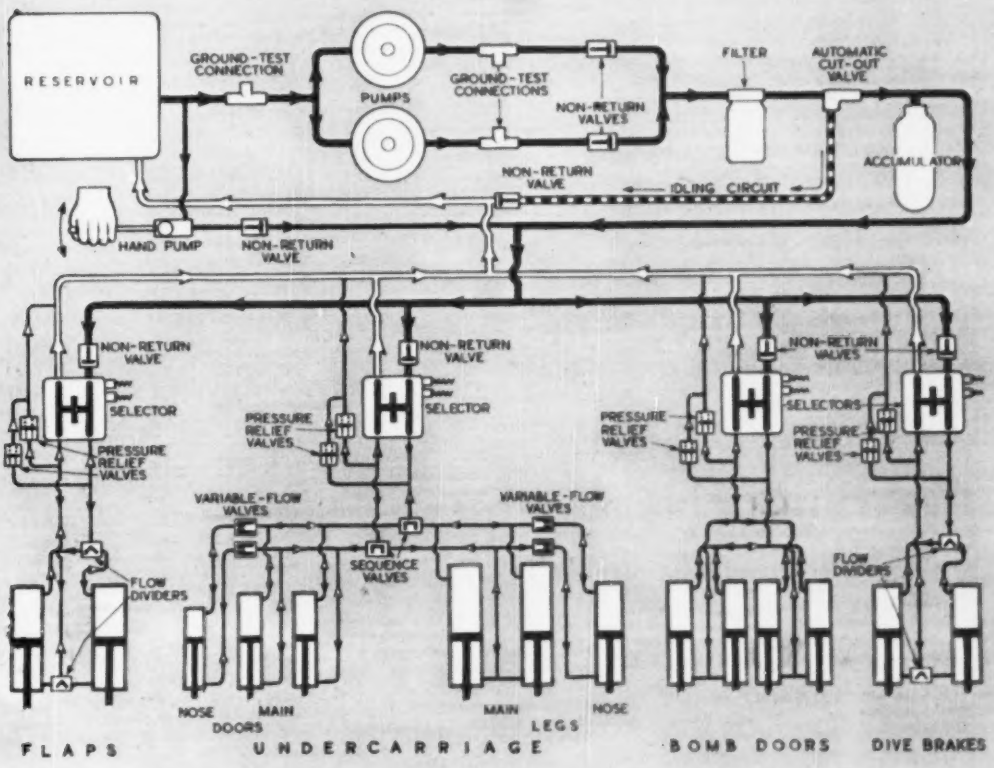
A Brief History, Together with an Appraisal of the Present State of the Art and a Survey of Future Trends

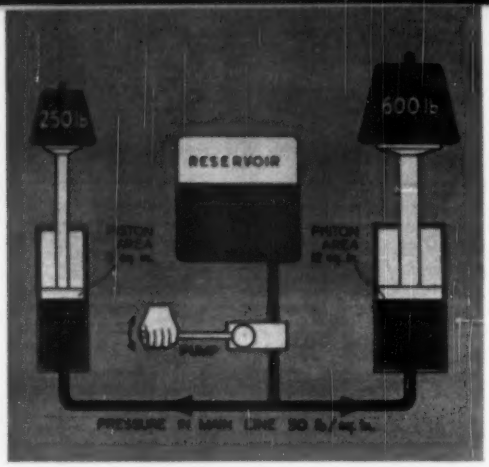
By THE TECHNICAL EDITOR

HYDRAULICS is the generic name given to the practice of transmitting effort and doing work through the medium of liquids: a procedure known and used by man for centuries. Liquids have the extremely useful qualities of fluidity and (for all practical purposes) incompressibility. It is, therefore, possible to transmit effort through a tortuous pipe-line, and between the application of force at one end and the resultant output of force at the other, the time lag is infinitesimal. Together with these attributes, the use of liquid as a transmission medium permits a wide variety of loads to be moved by the same input force. At one and the same time, therefore, a hydraulic system provides both positive transmissive action (no matter whether the flow path be direct or circuitous) and flexibility of application: as such, it is peculiarly well suited to actuation of the diversity of services found in the modern aircraft.

The first application of hydraulics to aircraft, however—other than the C.C. gun-gear—was not for actuating a service, but for absorbing landing shock; and, of course, the overwhelmingly greater proportion of aircraft to-day still employ hydraulics for this duty, although the original oleo shock struts first used have generally been displaced by oleo-pneumatic units. Oleo shock-absorbers are, nevertheless, being fitted to many of our most modern aircraft, albeit they are of a type undreamt of by hydraulic engineers of the old school. Less than ten years ago, Dowty Equipment, Ltd., one of the foremost British companies specializing in aircraft hydraulics, succeeded in developing a Liquid Spring, i.e., a unit in which orthodoxy is flouted by compressing liquid. Naturally, perhaps, the undercarriage was also the first part of an aircraft to which hydraulics were applied in an actuating capacity. The Messier experimental aircraft which first flew in 1934 was

Schematic diagram of the principal components and their relationship in the hydraulic system of a typical modern bomber. In the undercarriage circuit, the sequence valves ensure that the fairing doors open before the wheels are lowered and close after they are retracted, whilst the variable-flow valves cater for the reduced flow required by the nose jacks. The flow dividers in the flap and dive-brake circuits balance the movement of the port and starboard surfaces, and obviate the necessity for any form of mechanical interconnection.





One of the fundamental principles of hydraulics is that load equals piston area multiplied by pressure and, therefore, by the simple expedient of varying piston area, it is possible to move a number of dissimilar loads by a constant input pressure.

HYDRAULICS . . .

the first aircraft in Europe (and, possibly, in the world) to be equipped with a hydraulically retracted undercarriage.

As the biplane gave way to the monoplane and all-metal construction became more general, it was natural that loadings should increase and, with them, speeds and powers. But the advance in performance brought with it the necessity for such things as retractable undercarriages, flaps, cooling gills, radiator shutters and variable-pitch airscrews, and the advent of these several elements emphasized the necessity for some simple, efficient means of operating them: such a means was offered by hydraulics. As time went on, and aircraft began to take on a shape not much different from that we know to-day, the demands of war brought additional concomitant requirements for the actuation of bomb-doors, gun-turrets and dive-brakes on military aircraft, plus wing-folding and arrester-hook snubbing on naval types.

That services which are hydraulically actuated are, in general, moved by a jack which is fed with oil from a pump is common knowledge; but the detail of the hydraulic system is, perhaps, not so widely known. In order to rectify this, it might be as well briefly to run over the essentials of a typical modern system as applied, for example, to a multi-engined bomber. Although at first sight a complex thing, this is basically quite simple. The bare essentials for any hydraulic system are a reservoir of oil, a pump, selector valves, suitable pipe-lines and jacks to operate the individual services. These are primary requirements and although there is, in practice, a host of subsidiary units involved, to give a comprehensive description of all the components which are to be found in most aircraft hydraulic systems would need a sizeable volume, and as their purpose is more often than not clearly signified by their titles, no attempt will be made in this survey to cover anything other than basic principles and some of the later developments.

We have referred to the fact that a single input force is capable of moving a variety of loads, and this is achieved by so arranging that the area of the jack piston measured in square inches, multiplied by the load to be moved in pounds, is equivalent to the pressure exerted through the fluid in pounds per square inch. Thus, if the load in actuating service A is, say, six times greater than that in actuating service B, the jack piston area will need to be six times greater for A than for B. Speed of operation is also dependent upon piston area, the smaller the area (for a given flow rate) the greater the speed of operation.

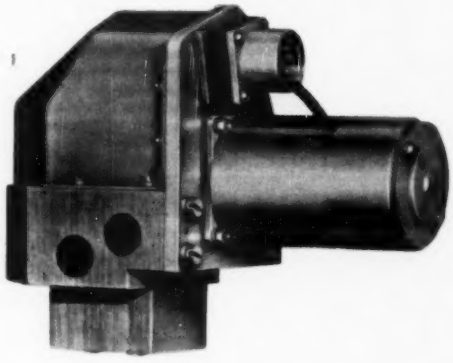
In an accompanying illustration is shown a simplified diagrammatic layout for a modern bomber's hydraulic system; this serves to show the relative disposition and interconnection between the several basic units but, it should be emphasized, it is not intended to represent an actual installation. It is normal practice with multi-engined types to employ two pumps, each driven from a separate engine. In most systems, irrespective of size, a hand-pump is also embodied to permit emergency actuation in the event of engine failure and, in addition, to enable routine ground-testing to be carried out without the necessity of running the engine(s); alternatively, ground test-rigs can be coupled into the system through the ground test connections.

Both pumps jointly derive oil from the reservoir (which, nowadays, is often pressurized for high-altitude operation) and deliver it via non-return valves and a filter to the automatic cut-out. This unit functions as a type of hydraulic clutch; since the pumps are delivering oil the whole time that the engines are running—despite the fact that no service may be in operation—some form of de-clutching effect must be provided. When no service is being actuated, the automatic cut-out diverts the pump delivery back to reservoir, so forming an idling circuit; but immediately a service is selected, the cut-out reacts and delivers the full flow from the pumps into the main pressure line, from which the various service control units are fed. If pumps of variable-delivery, or automatic off-loading, type are used the automatic cut-out is not necessary since its function is embodied in the pump itself.

The whole of the system is completely filled with oil—any condition of aero-embolism is rigorously eliminated by bleeding—and when a selection is made, and pressure forces a piston along its jack cylinder, the oil on the opposite side of the piston is expelled back through the selector unit into the return line to reservoir. As may be seen from the diagram, the main pressure and return lines cater for flow in one direction only, as do the branch pipes to and from the selector units, whereas the pipes between the jacks and their selector units carry flow in either direction according to whether the jacks are being extended or contracted.

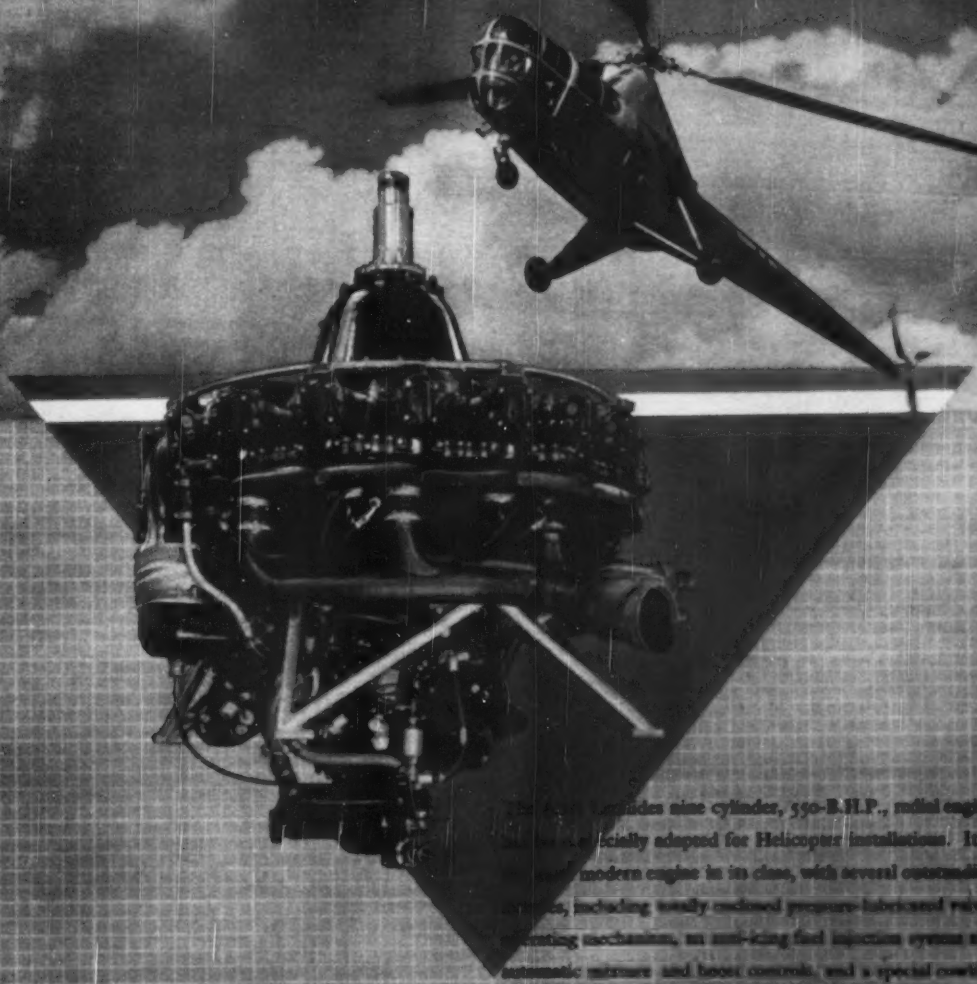
The hydraulic accumulator which is connected into the main pressure line from the automatic cut-out is incorporated for two purposes, (i) it accommodates some of the oil which is fed to the system at a high rate and would otherwise operate the smaller jacks too quickly and, (ii) it serves as a shock-absorber; for example, were no accumulator fitted, the sudden reaction of the automatic cut-out and the resulting immediate large-volume delivery of oil would impose a shock load on the system. The best-known form of hydraulic accumulator consists essentially of a cylinder divided into two chambers by a free-floating piston, one chamber containing compressed air and the

The British Messier electro-selector embodies a unit motor which, through a leadscrew and cam system, operates a pilot valve; this provides a servo-action used, in turn, to operate the main valves.



ALVIS LEONIDES

the Power Plant of
the Westland-Sikorsky S.[illegible] Helicopter



...ides nine cylinder, 550-B.H.P., radial engine ...cially adapted for Helicopter installations. It is ... modern engine in its class, with several outstanding ..., including vastly reduced pressure-lubricated valve-...ting mechanism, an anti-icing fuel injection system and ...matic mixture and boost controls, and a special cowling ...rangement, with pressure baffles and fan

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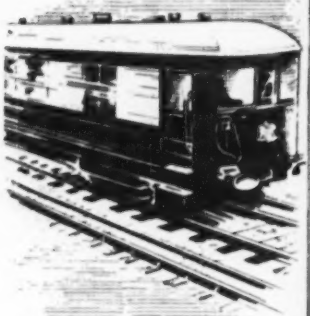
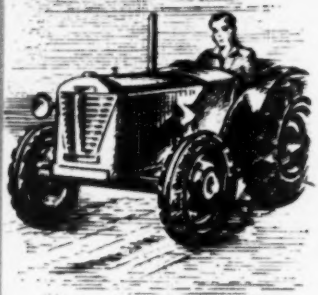
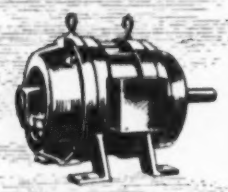
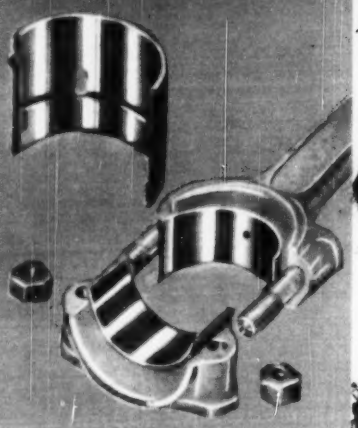
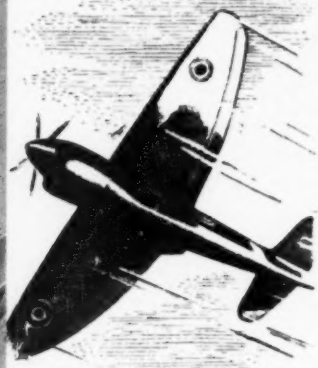
VANDERVELL THIN WALL BEARINGS FOR EVERY PURPOSE

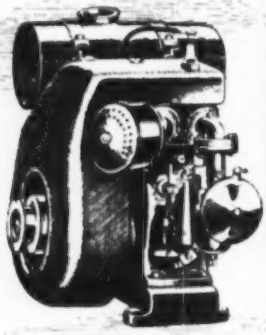


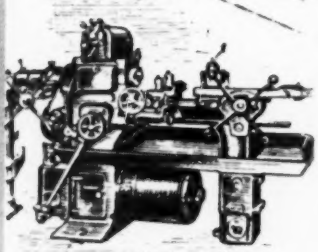












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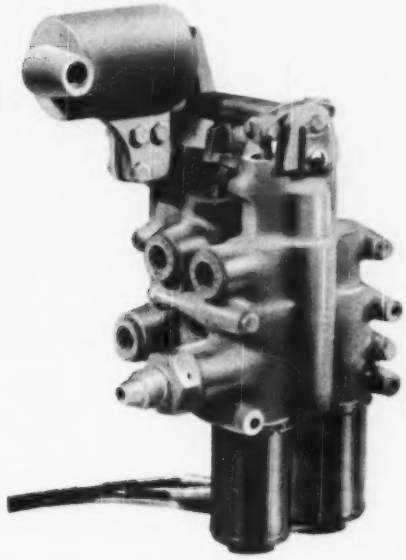


The Electro-Hydraulics selector embodies four distributor valves, a pressure-maintaining valve and two solenoid-operated valves. When energized, a solenoid valve directs fluid to a small piston, which displaces the operating lever of a rocker arm—seen on top of the body—which, in turn, releases the distributor valves to open up supply and return passages to and from the jack(s).

other chamber oil. The oil chamber is connected into the main pressure line, and when oil is fed from the automatic cut-out, the oil chamber is charged. Introduction of oil into the accumulator forces the piston up the cylinder, so compressing the air and cushioning the shock of delivery.

Another duty performed by the accumulator is the storage of pressure, and when a lightly loaded service (for example, hood-canopy closure) is selected, actuation of the jack(s) is effected by the pressure stored in the compressed air compartment of the accumulator. If several selections of this nature are made, the pressure of the compressed air drops to a value at which the automatic cut-out will react and immediately recharge the accumulator. It is not unknown for two accumulators to be used in a system, and sometimes opportunity is taken to pipe the air chamber of the accumulator(s) to compressed-air bottles so that, in an emergency involving loss of hydraulic power, air from the bottles can be introduced to the accumulator(s) to provide a pressure source for the actuation of such essential services as flaps, dive brakes and undercarriage. Another, and more widely practised, method is to pipe the compressed air direct to the appropriate jacks, usually via air-shuttle-valves which serve to isolate the jacks from the remainder of the system.

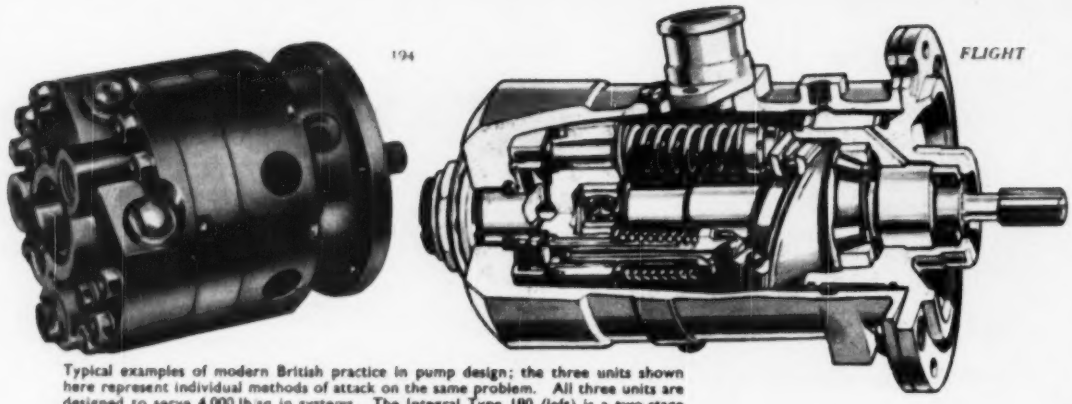
When all the selector units are at neutral, the valves inside the units are all closed and no oil flow is possible. All the fluid in the system, with the exception of that circulating in the idling circuit, is trapped in the pipe-lines and jacks and is maintained at the reaction pressure of the cut-out. This trapping of the oil between jacks and selector units provides a form of integral locking which holds the jack secure from movement in its obtaining position. It is, however, possible for excess pressure to be built up by thermal expansion in the oil trapped between various units. For this reason, pressure-relief valves are fitted at various points throughout the system; however, the pressure-relief valve in the "down" line of the flap circuit is normally adjusted to relieve at a lower figure than the other relief valves in order to allow the flaps to "blow up" if the safe air speed for lowered flaps should happen to be exceeded.

So much for operational foundation. Having stated the basic design case, we might proceed to a review of present developments, but before doing so, it is worth while to look back a little and take note of the way in which aircraft hydraulics have progressed. First, there has been a steady increase in operating pressures: whereas some of the early systems worked at pressures of 300 to 800 lb/sq in, systems of 1,000 to 1,200 lb/sq in were being installed just before the war. It was, of course, as a result of the war that there was a general step-up, and many aircraft were equipped with 2,000 to 2,500 lb/sq in systems—which, indeed, still serves as an average value for most aircraft now in operation. Some of the newer types are employing 3,000 lb/sq in, but many of the latest designs still in the preliminary stages will utilize 4,000 lb/sq in systems.

All our specialist hydraulic firms have conducted extensive research into the pros and cons of elevated pressures, and have carried the development of the myriad components to an advanced stage of reliability. The reason for employing high pressures is manifest, for the higher the maximum operating pressure of a hydraulic system, the lighter and smaller need to be the several components, and the two qualities which, above all others, preoccupy aircraft engineers are weight and bulk for a given performance. Weight saving as a result of increase in operating pressure is difficult to determine on a generalized basis, but in broad terms it has been found that by increasing pressure from 2,000 lb/sq in to 3,000 lb/sq in, a weight reduction of 6 per cent could be achieved, whilst an increase from 3,000 lb/sq in to 4,000 lb/sq in would give a saving of 12 per cent.

There are, nevertheless, practical limitations; it would be absurd to have a pressure so high that, for example, the necessary diameter of a jack was thereby reduced to such a degree that the jack would no longer function safely as a mechanical strut. Another limitation is the reliability of valves and seals. However, the fact that 4,000 lb/sq in systems are to be used for many of the types which will

This example of a Dowty Power Pack comprises a pump, submerged in a reservoir with a filter in the return circuit. The pump is directly driven by an electric motor and is automatically switched off by limit switches. The unit is mounted adjacent to the service.



Typical examples of modern British practice in pump design; the three units shown here represent individual methods of attack on the same problem. All three units are designed to serve 4,000 lb/sq in systems. The Integral Type 180 (left) is a two-stage gear-and-piston pump incorporating automatic off-loading; the British Messier unit (centre) is a constant-delivery type employing swashplate actuation, whilst the Lockheed Mk 7 pump (right) is a constant-delivery piston-displacement type with radial cylinders.

HYDRAULICS . . .

be flying in the relatively near future does seem to imply that the problems involved have been solved.

Although directly affected by operating pressure, reliability *per se* has also been a considerable factor in the development of aircraft hydraulics. In the case of military aircraft reliability is of secondary importance, since the life expectation is relatively short. In direct antithesis, for commercial aircraft, reliability is the primary requirement, since it is necessary for the whole hydraulic system to work efficiently for a life five to six times as long as that of a military installation. This fact alone has had a marked effect on the basis of component design, for during the war, the greater number of parts in any hydraulic component were stressed on a static stress basis whereas now, owing to the much greater civil life demand, fatigue strength has become the cardinal factor. Naturally enough, in that the greater proportion of a military system is common with a civil installation, the changed basis of part design can have nothing but a beneficial effect on military aircraft installations.

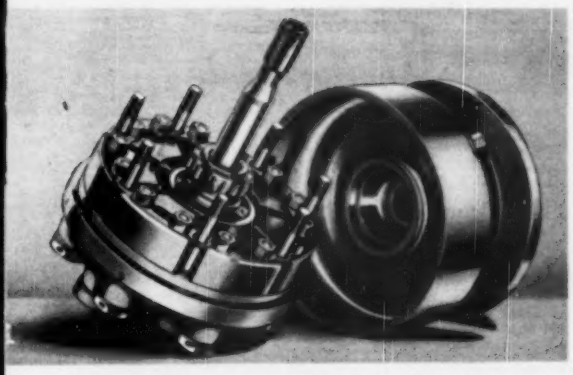
As with so many other aspects of aeronautical engineering, hydraulics as a practice has not been the subject of any particularly "revolutionary" advance over the years. Rather has the progress been one of steady refinement with each step forward made in the comforting knowledge of established background performance. The demands made on the hydraulic specialist have, nevertheless, been unrelenting, and this, coupled with the extensive research facilities which all British hydraulic concerns have built up, has led to the development of many new components. In general, these are not such as to perform an entirely new duty, but rather to do a particular job more efficiently or more conveniently—in most cases, by virtue of enlisting the aid of electrics. The marriage between the erstwhile Montague and Capulet houses of hydraulics and electrics has proved to be a very happy and fruitful union. There are, in fact, few modern aircraft in whose hydraulic systems electrics have no part. Naturally enough, the application of electrical units to hydraulic components offers enormous scope for diversity, so much so, in fact, that we can do no more than touch upon one or two representative examples of current designs.

Perhaps the first application of electrics was to control valves, or selectors, and this immediately offered a number of advantages. It permitted the removal of manually operated control valves from the cockpit, and in their place made possible the installation of compact, lightweight selector switches of lever or push-button type. This in turn permitted the installation of the selector units at the most convenient locations in relation to their individual circuits, and saved the weight of hydraulic pipe-lines to the cockpit by replacing them with simple, electric leads. Another advantage of the electro-hydraulic selector is bound up with the use of higher system pressures. With the use of increased pressures, the manual effort involved in operating the selector valves becomes impracticably high, and this is aggravated particularly in high-speed aircraft where the time and physical effort a pilot can spare to initiate a service is limited.

Electro-hydraulic selectors are available in a variety of designs, the valves being actuated either by magnets, by solenoids or by unit motor drive. In some, the electrical actuation is confined to the movement of a pilot valve, by means of which the main valves are hydraulically operated. Electrics also offer a convenient means of introducing preselective and automatic cut-off action. For example, it is useful to be able to select a percentage extension of, say, flaps or dive brakes, and with no further attention on the part of the pilot, to have the service automatically stopped at the desired condition.

Before leaving the electrical aspect, mention should be made of a rather interesting innovation, introduced by the Dowty Company. Known as the Power Pack system, this new departure is so far available in two forms, in one, the pump is housed in a reservoir containing just sufficient fluid to cater for the retraction of the jack(s), and is driven directly by an electric motor which is switched on when the service is required, and is switched off by limit switches. This type of Power Pack is installed close to the jack(s) so as to minimize pipe runs. The other form of Power Pack differs in that the output of the pump is employed solely to charge an accumulator, the capacity of which is sufficient to operate all the essential services. The pump motor is actuated by a pressure-sensitive switch, which operates the motor switch gear through relays. The primary object of this system is to enable the whole hydraulic system to be ground-tested merely by plugging in one electrical lead—a simplification which is of particular value in affording time-saving on civil schedules.

Apart from their intrinsic design as flow generators, hydraulic pumps are readily divisible into two basic types, viz., those of constant output (for a given speed), and those which incorporate automatic off-loading actuation. Pumps of the latter type—as already noted—render unnecessary the incorporation in the system of an automatic cut-out and a hydraulic accumulator, although an accumulator is, in fact, sometimes retained to serve as a shock absorber. One of the most famous of aircraft hydraulic pumps is the Lockheed Mk 6, produced by the Automotive Products Co., Ltd.; a seven-cylinder radial unit of fixed-delivery type, the Mk 6 is cleared for 3,000 lb/sq in at 3,000 r.p.m., and has been made in greater quantity than, perhaps, any other of its type. An essentially similar variant, the Mk 7, has recently been introduced for 4,000 lb/sq in systems. The pumps produced by Integral, Ltd., have also enjoyed very wide use, and one of the latest versions, the Type 180, embodies a gear-type first (low-pressure) stage and a piston-type second (high-pressure) stage. Incorporating automatic off-loading, this unit is designed to give a close approximation



to a constant-work characteristic, and is suitable for system pressures up to 4,000 lb/sq in. Among the aircraft hydraulic pumps, that produced by British Messier, Ltd., is unusual in its employment of a swashplate for actuation of the seven piston/cylinder assemblies. These last named incorporate uniflow valve action, and a feature of the pump is its high volumetric efficiency at its rated pressure of 4,000 lb/sq in.

A hydraulic component of relatively recent origin is the flow-divider, the purpose of which, as its name suggests, is to divide the flow in one pipe into two equal flows, irrespective of variations in back-pressure which may exist in the two outlet pipes. Such a device is of great use in such circuits as those serving flaps and dive brakes, where synchronization is a primary requirement. Before the advent of the flow-divider, sympathetic action of port and starboard services was most usually obtained by means of mechanical interconnection, but with the plethora of equipment carried by the modern aircraft, plus the aggravating circumstances of reduced stowage availability, mechanical interconnection is vastly difficult to arrange, and thus the flow-divider is a most convenient alternative. It does, in addition, permit some considerable weight-saving over a mechanical cross-linkage.

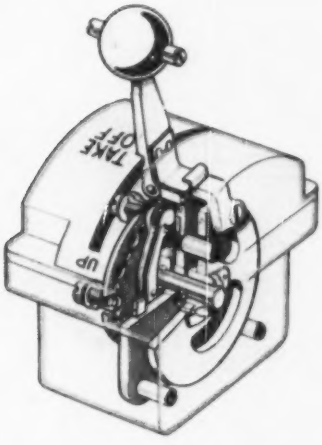
The general adoption of nosewheel undercarriages led to a further addition to the family of hydraulically actuated services, viz., nosewheel steering. As in most other hydraulic applications, some considerable diversity exists in the designs offered by the various companies. That devised by the Automotive Products Co. is representative of the best modern practice; use is made of a special steering jack of the follow-up type which, in addition to its steering function, provides (by hydraulic means) positive control of shimmy, and serves to limit the torque transmitted to the aircraft structure in towing conditions. Steering control is designed to be light and sensitive to the pilot's actions, and with an available power-steering angle of up to 120 deg, the mechanism is arranged automatically to centralize when the power is switched off—or in the event of power failure. In this condition, the nosewheel assembly becomes self-centring and castering.

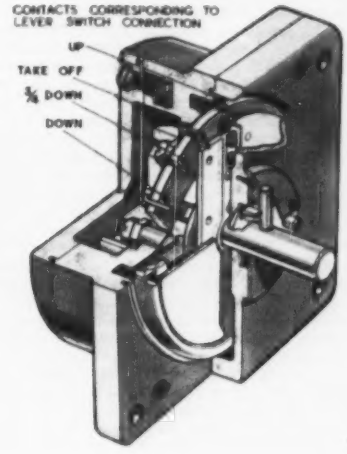
The ordinary hydraulic jack has changed little in basic design during the years. It has become somewhat slimmer and lighter, as a result of the increase in operating pressures, and it is now equipped with vastly more efficient glands and sealing media than were its predecessors of even a decade ago.

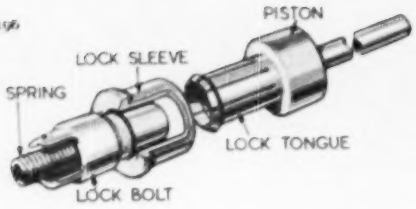
To-day, the inherent hydraulic lock, by means of trapping the oil, is scarcely ever relied upon. The great increase in loadings, the pressure loss if a pipe is fractured or a gland leaks, the necessity for pressure relief as a result of thermal expansion, the complicated geometry which is often unavoidable in, for example, the retraction of an undercarriage—all these factors militate against reliance on the hydraulic lock. As a result, positive latch-locking is most often used in connection with undercarriages, and, often enough, in other applications as well. A system which, however, offers many attractions is the collet-type internal lock, which was devised by the French Messier company. This is now used by British Messier, Ltd., by Electro-Hydraulics, Ltd., and, in variations on the original theme, by some other companies. The component parts of the collet lock as fitted in an Electro-Hydraulics jack are shown in the accompanying illustration, together with a schematic diagram defining the operation of the lock.

The lock tongue, or collet, is attached directly to the jack piston, and the lock sleeve is an integral shoulder formed in the jack cylinder bore. The lock bolt is a stepped diaphragm, bearing against a coil spring abutting the end-wall of the jack cylinder. When oil pressure is directed to the underside of the piston (and the oil volume above the piston is free to return to reservoir) the piston

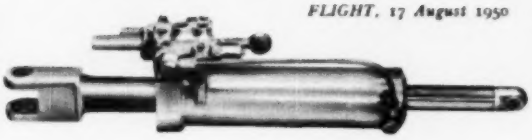
The Dowty flap lever-switch (left) and drum-switch (right) complement each other. When the pilot makes a selection on the lever switch, current is passed through the drum-switch to energize the selector unit of the flap circuit; and as the drum-switch is mechanically linked to the flaps its contacts are broken when the latter have reached the desired setting, so de-energizing the selector and closing the circuit.



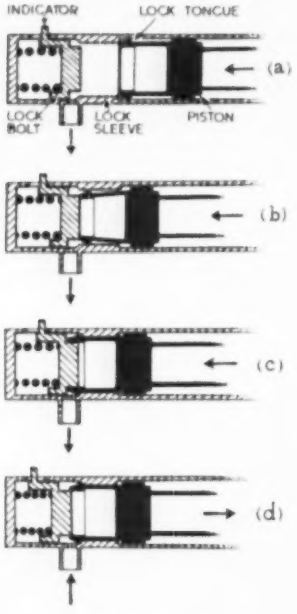




Above are shown component elements of the collet-type positive-action lock of an Electro-Hydraulics jack, and below are seen sequence diagrams illustrating the simple method of operation.



Typical Lockheed combined steering jack and shimmy damper for a nosewheel undercarriage. Power steering through 120 deg is possible, alternative to castering and automatic self-centering.



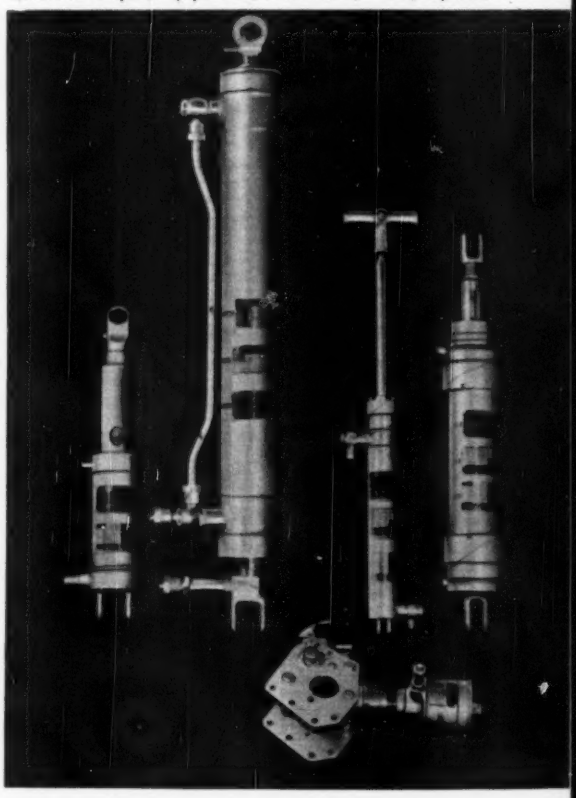
HYDRAULICS . . .

moves until the rim of the lock tongue engages the inner shoulder of the lock sleeve (a). Continued pressure beneath the piston forces it along so that the lock tongue is constricted and rides over the lock sleeve and butts against the lock bolt (b). As the piston continues to move, the lock-bolt spring is compressed, until the lock-tongue segments are free to expand over the outer shoulder of the lock sleeve. Immediately they have done this, the lock bolt, under the action of its spring, is forced down inside the lock tongue, so preventing it from contracting and trapping its rim above the lock sleeve (c). The freeing action is equally simple: reversal of oil flow introduces high-pressure oil to the interior of the lock tongue, and the only part which can move is the lock bolt. Oil pressure reacting against the piston forces the lock bolt free from engagement with the lock tongue, until the spring is fully compressed; continuing pressure—now reacting against the immovable lock bolt—causes the piston to pull the rim of the lock tongue over the lock sleeve shoulder and thus out of engagement. This essentially simple and highly efficient form of jack locking is, of course, applicable at both ends of the jack in order to lock the piston rod both in the fully contracted and fully extended positions.

From the broad survey given, it will have been apparent that, as aircraft design has progressed, so has the technique of the hydraulic specialist progressed in parallel. As aircraft continued to become more and more complex, so the field of hydraulically actuated services has grown wider and wider until, to-day, the list embraces a great diversity of applications from windscreen wipers to bomb-doors, from powered flying controls to flight refuelling gear. In that hydraulics is, nevertheless, a branch of the science of fluid flow—it is half-brother to aerodynamics—no matter how diverse the individual applications may be, the fundamental principles are common to all.

What of the future? It is reasonable to suppose that, as time goes on, operating pressures will go even higher, and that the partnership with electricity will be extended. That the individual problems will become progressively more difficult of solution is almost inevitable, for the range of development within the limits of practicability cannot help but gradually dwindle. That the problems will be solved, however, is equally certain.

Typical selection of aircraft jacks (designed and manufactured by Electro-Hydraulics, Ltd., for the Hermes IV). From left to right: nose undercarriage jack, main undercarriage jack, main u/c down-lock jack, flap jack and, front centre, main u/c up-lock.



SHOOTING STARS IN KOREA

"*Combat Report*" *on the First American Jets to See Action*

LOCKHEED F-80c Shooting Stars of the U.S.A.F. Fifth Air Force have been in action—mainly on ground-attack duties—since the outbreak of the Korean war, and thus become the first American jet aircraft to see operational service. Writing for our American contemporary *Aviation Week*, Mr. A. W. Jessup has made an interesting and timely first-hand report on the F-80's combat performance. Some of his observations were recorded briefly in last week's issue of *Flight*, with due acknowledgment. We now give a fuller summary.

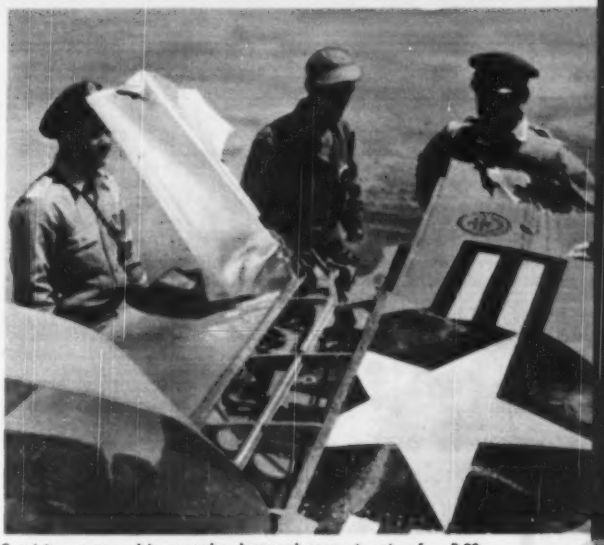
"During the first days of the war," writes Jessup, "bad weather hampered air operations. Seldom was the ceiling greater than 3,000ft. This did not interfere with strafing by the F-80s of troops and trucks. But it did upset the rocket attacks on tanks. Pilots had to make low-level rocket runs. Many rockets fell short. Others hit at such a low angle that they ricochetted off the tank instead of blasting into it.

"When the weather lifted, pilots began making their rocket runs from altitudes above 5,000ft at a dive angle of about 60 deg. As long as the rockets fire properly—many of the 5in rockets are from old World War II stock—pilots say they just can't miss. At the 60-deg dive angle, rockets seldom ricochet even off the heaviest tanks." Pilots thought that low-level attacks with armour-piercing or training rockets might be effective, but admitted that dive-attacks were the most accurate.

The first problem was getting the F-80s to the target area and back with enough time allowance on the deck for effective combat operation. "With conventional tip-tanks this was wellnigh impossible. Preliminary experimentation had been undertaken several months ago by the 9th Squadron of the 49th Fighter-Bomber Group with an enlarged tip-tank. Use of it had been forbidden by the Air Force, but when war broke, permission was given to try it out.

"The new tip-tank is made by taking centre sections from two Fletcher tanks and inserting these into a third tank. Each holds 260 [U.S.] gall of fuel, 95 gall more than the smaller tanks. With this additional 190 gall the F-80s have been going to targets 400 miles away, spending 20 to 25 operational minutes on the deck."

When empty, the tanks did not change flying characteristics of the F-80, but the attachment shackles were weak and several tanks had broken away during pull-outs. The real danger, however, was on take-off, when loss of one full tank might cause the aircraft to roll into the ground.



Servicing personnel inspect the shattered port wing-tip of an F-80 which returned to base despite obviously severe battle-damage.

Writing of the unnamed base from which the F-80s were operating, Jessup reported that the strip had limited their effectiveness. "It is macadam which softens in the heat, making it slow as well as rough. . . . F-80s can take off with only two 5-in rockets, except during the first hours of the morning when it is cool. Then they get off with four. Normally, the F-80 should carry eight rockets. With a good concrete strip there would be no difficulty." [Readers may remember that the Shooting Star pictured in *Flight* of August 3rd was carrying two rockets only.]

The F-80 had shown ability to take battle punishment, and had been subjected to pull-out forces as severe as 12g—apparently without harm to the airframe. Jessup reports that enemy ground fire up to 40 mm had caused hits in almost every part of the power-unit—flame tubes, plenum chamber, compressor chamber and turbine. About the only places unhit had been the compressor, oil system and fuel system (but maintenance experts believed that an F-80 could return with the oil system shot out). Wing-tips had been sheared by steel cable, and one aircraft, attacking a bridge, hit a one-inch cable on the nose. It broke the cable, which slashed the skin of the wing. Otherwise there was no damage. Another F-80—hit by a 40 mm shell which tore through the tailpipe—returned safely, was repaired and returned to combat duties.

"Hits in the flame tubes or tailpipe were expected to lead to burning of the surface and probable fires. This fear has been unfounded so far. Only slight scorching has been found around flame tube hits, and not even that around tailpipe holes.

"One F-80 took a hit in the turbine, knocking out several buckets [blades]. The pilot flew back to base and claims he did not know he had been hit. Lockheed's technical representative, Noble G. Heuter, claims that there must have been severe vibration, but not according to the pilot."

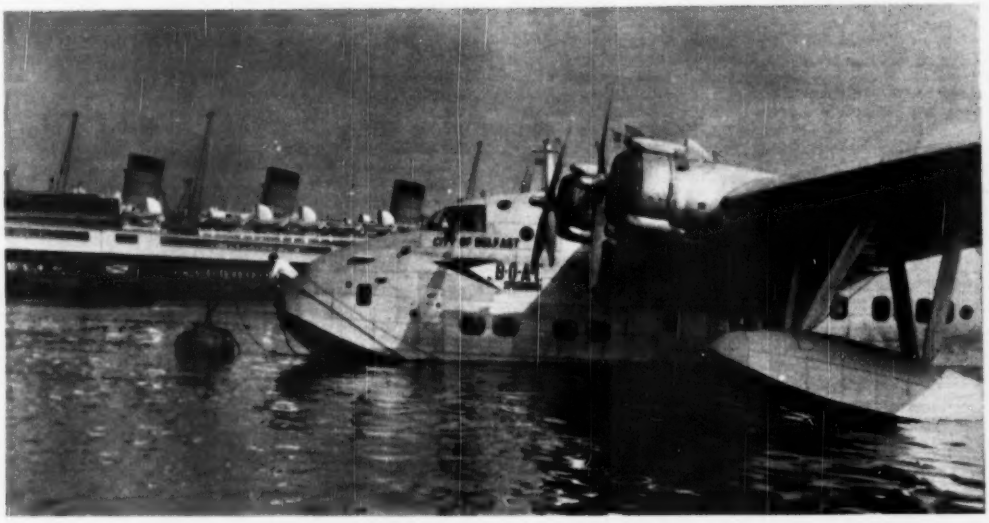
Maintenance had not only been less than would have been required by piston-engined aircraft, but was less in combat than during peacetime F-80 operations. There had been far fewer turbojet changes, fewer broken turbine blades and fewer filter changes. This was partly due to the exclusive use of kerosene: "When 100-octane was used for starting and stopping, lead oxide formed on the buckets, making them brittle. This no longer happens. JP-1 apparently has a lubricating action in the boost pump eliminating corrosion troubles there."

Concerning the advantages or otherwise of high-speed ground-support, Jessup remarks: "Early battle reports insisted that the F-80 was too speedy. Pilots deny this. They want all the speed they can get. At first they had to learn how to use the speed. Having done this, they are confident they can knock down slower and more manœuvrable conventional aircraft.

This F-80 belly-landed in a flooded South Korean paddy-field when its hydraulic system was damaged by flak in a low-level attack.

SEAFARERS

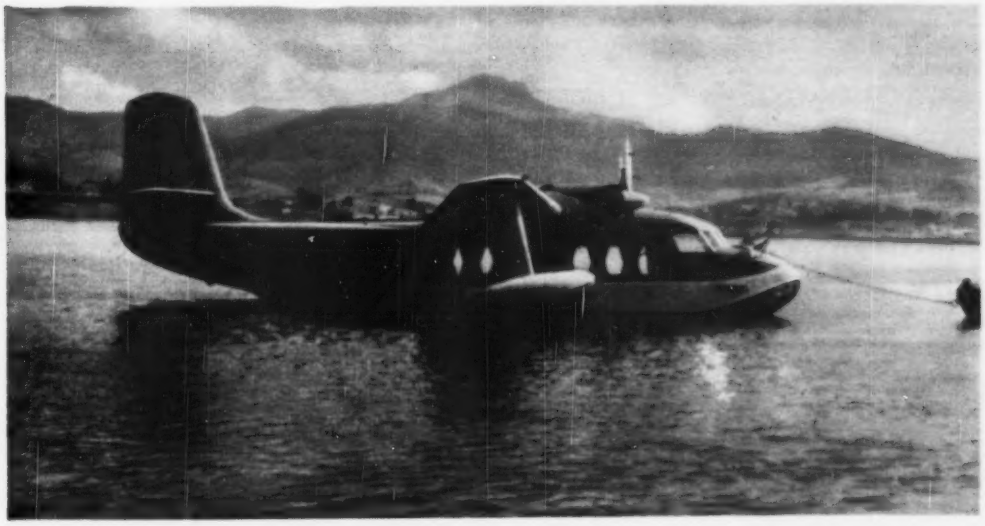
A Proud Company of British Craft Pictured in Two Elements



"THE liner," Kipling maintained, "she's a lady"; and who, having seen the Cunarder *Queen Mary* at speed in squally North Atlantic weather, could disagree? An R.A.F. photographer did see her so, and his picture opposite surely bears out the Poet of Empire.

It is a pleasing thought that the grace and majesty of such vessels is inherent in British flying boats, of which the Short Sunderland, as depicted on the right over the cruiser *Aurora*, may go down in history as the most famous of all—certainly one of the longest-lived. That a Sunderland replacement is being studied is reassuring, but years must elapse before such a machine could be in service. The Seaford, closely akin to the civil Solent, seen at centre left, was built—but never adopted—to succeed the Sunderland, of which type large stocks were on hand at the war's end. Much of the character of these big craft is discernible in the little Sealand amphibian (below); this is a light transport or air yacht of great distinction.

The quality of British air and sea craft, in fact, persists in all shapes and sizes, even to the airborne lifeboat seen (bottom right) snug under the fuselage of an air/sea-rescue Lancaster, skimming low over St. Merryn. That a company most famed for its marine aircraft is equally adept at constructing landplanes or deck-landing types is proved by the success of the Short Sturgeon (two Rolls Royce Merlin engines) seen at the foot of the opposite page leaving the deck of H.M.S. *Illustrious*.



CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Veterans on Show

APROPOS the flying, at the recent R.A.F. Display, of the 1909 Bleriot, you state in your caption on page 102 in the July 20th issue of *Flight* that this machine was "the 1909 Gordon-Bennett Bleriot." Actually, however, it was not. As Air Reporter No. 1, attending the world's first air meeting at Rheims, in August, 1909, I watched and described the first of all Gordon-Bennett aeroplane speed races, and it was specifically for this particular event that Bleriot designed and flew what was then an entirely new type of Bleriot monoplane. Instead of the pilot's seat being on the top of the fuselage it was placed underneath the wing, while instead of using, as in his cross-Channel model, a 25 h.p. Anzani engine, he fitted a 60 h.p. E.N.V. A photograph from my collection is enclosed.

In the actual Gordon-Bennett race Bleriot was lapping the Rheims course at about 60 miles an hour when an oil pipe burst, and he had to make a very awkward landing, the machine then being destroyed by fire.

It was a replica of this racing monoplane which our pioneer British air champion, Grahame-White, arranged to acquire from Bleriot, and in it at the Issy flying-ground, outside Paris, early one morning soon afterwards, "G.-W." managed to make some short straight flights after taxying up and down a few times to get the "feel" of the controls. That he should have managed to get into the air so quickly, and to have landed safely, astonished all concerned, and in the Paris newspapers next day he was acclaimed as "the Englishman who learned to fly in 20 minutes"!

Bleriot, so far as I can remember, did not put this racing type of 1909 into anything like production. Actually the one Grahame-White bought, and when Bleriot himself was subsequently at the controls in a test flight, made a bad landing and wrote itself off while Bleriot was trying to avoid some trees while flying low. The next Bleriot-type racer, in which Grahame-White won the Gordon-Bennett of 1910, was a monoplane with the pilot's seat back again on the top of the fuselage, but this time driven by a 14-cylinder Gnome developing 100 h.p.

HARRY HARPER.

Epsom, Surrey.

The Bleriot mentioned by Mr. Harry Harper. A fin extended over the whole length of the tail. Note the unusual double tailplane.

The South Coast Race

SINCE the publication of the regulations for the *Daily Express* Challenge Trophy Air Race, very great disappointment has been caused among the small fry—private owners, flying clubs and others—who are debarred from entry by the minimum-speed proviso.

The sponsors and the Royal Aero Club no doubt have good reason for ruling-out the slower aircraft, but it is causing much adverse comment for various reasons, and there is a definite feeling that the smaller and slower aircraft have been excluded as a class in favour of the faster and more expensive types.

The object of the race—to commemorate the tenth anniversary of the Battle of Britain—will have wide popular appeal and much sentimental interest, especially to the ex-R.A.F. personnel who are now members of flying clubs, or who own small private aircraft, and these are largely the types being excluded, hence the disappointment.

It must be remembered that it is on these slow old types of training machines that the R.A.F. was built and trained, so they have wide sentimental interest. Whilst the expensive and faster aircraft are no doubt very nice to fly in and to look at on the ground, they have less interest in the air to the average spectator—of which there will probably be upwards of two or three hundred thousands—because the fast aircraft come and go in a matter of seconds, whereas the slow machine lumbers along and is in view to the spectator for a full minute, during which the commentators will have ample time to explain the past glory and history of these ancient aircraft.

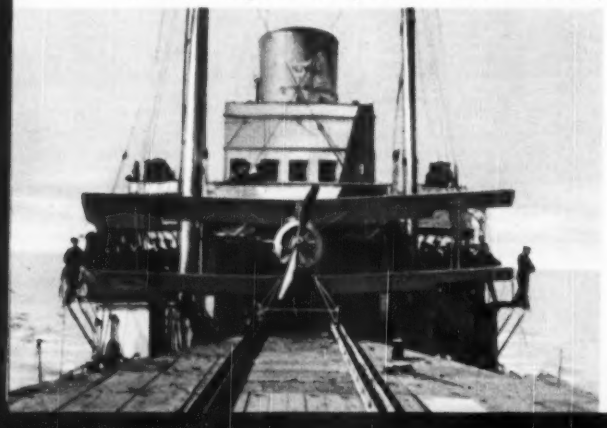
Everyone realizes there are difficulties, but they are not insurmountable, the main one being probably the lack of range; however, this could be overcome if there were to be a refuelling stop half-way for the slower aircraft, with a compulsory stop of ten minutes; or, alternatively, the race could end or commence at a suitable shorter distance for the entries below a certain speed limit.

E. V. PYLE, A.R.Ae.S.

Bristol, 4.

[While we join with our correspondent in regretting what may (if a large entry is received) be a necessary limitation, we cannot agree that (for example) a P.1081 "has less interest to the average spectator" than has a Tiger Moth. —ED.]

Deck-launching a Sopwith Pup—fitted with a skid undercarriage—from H.M.S. *Slinger* in 1917. (See letter from Mr. C. A. Rea.)



Early Deck Landings

REFERENCE Mr. A. H. Curtis's letter in *Flight* of July 20th in connection with S/L. H. R. Bunn's article, "Deck Landing Long Ago," may I mention that, as an early R.N.A.S. pilot, subsequently merged into the R.A.F., I was one of two pilots selected to represent this country in the 1924 Schneider Trophy contest. The other pilot was Capt. H. S. Broad.

At that time I was stationed at the M.A.E.E., Felixtowe, where the Gloster-Napier seaplane entry was tested; unfortunately, when alighting after its first flight it crashed and Broad, who was piloting, performed some unrehearsed "hydrobatics," but escaped with a shaking.

The Air Ministry, with some reluctance, granted special leave for a Service pilot to take part in the contest. Sea passages and accommodation at Baltimore were booked and, as can be imagined, it was a great disappointment to all concerned that the British entry had to be scratched.

The accompanying photographs [one of which is reproduced here—ED.], taken on board H.M.S. *Slinger* early in 1917, may be of interest.

C. A. REA.

London, S.W.19.

IN regard to the letter from Mr. A. H. Curtis in *Flight* of July 20th stating that F/L. Kinkead was also a Naval pilot I would like to endorse that statement. Felixtowe in those days was an interesting mixture of R.A.F. and F.A.A., and a grand bunch of fellows they were too.

I don't think any R.A.F. personnel, either flying or ground staff, were entirely pleased to be posted to the F.A.A. for a two-year "cruise"; most preferred to serve their five years in the Middle East or India on land craft.

However, I enjoyed some interesting and happy times with the high-speed flight of 1931, and I would like to say, since Lt. Brinton's name was mentioned in the article by S/L.

SOCIETY
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FARNBOROUGH

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CORRESPONDENCE . . .

Bunn and in the letter from Mr. Curtis, that I was present when Lt. Brinton came to a tragic and untimely end on the evening of August 18th, 1931. I have a photograph I took from the top of Calshot Castle of his machine, the Supermarine S.6, being towed out for the practice run the same morning, showing Lt. Brinton in the cockpit. He was killed at approximately 8 p.m. and, believe me, we in the flight felt as though a great hole had been torn in our family.

GROUND ENGINEER, 508153.

Mansfield, Notts.

Customs Consideration

APROPOS the letter from Mr. A. Jenkins in *Flight* of July 27th re Gatwick, having cleared many times from Southend and Lympne and always having had prompt and helpful service at both places, I would not like the officers there to get left without a bouquet.

At Nice, recently, I was marshalled on arrival to a point about 400 yards from the Customs and was then expected to carry my ten pieces of baggage. I flatly refused and taxied my aircraft to the Customs area, to the surprise of all concerned. I was told I could have "got a taxi." Fancy getting a taxi before clearing the Customs inwards! By making a mistake and charging me double landing tax they parried my heated disapproval of the whole darned outfit.

I moved over to Cannes, 15 minutes away at most, where I found exactly the opposite—most helpful people. At Tetuan (Spanish Morocco), I spent four anxious hours simply waiting for my logbook; everything else was cleared, and the control wallah was just missing.

But in general the airports of Europe are usually out to help the private owner.

Cosby, Leicester. J. C. RICE.

In Brief

On behalf of the Association of Pioneer Motor Cyclists, Mr. Harold Karslake (1, Broxstowe Rise, Cinderhill, Nottingham) is preparing an official history of the motor cycle industry, and wishes to collect information from firms which, now in the aircraft industry, may at some time in the past have been concerned with motor cycle manufacture.

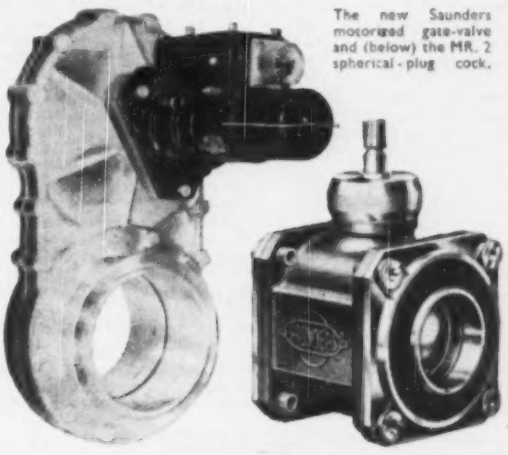
* * *

Mr. Harold Pratley, 72, Walpole Road, London, E.18, has a 300 h.p. Sunbeam-Manitou vee-twelve engine (1916-20) and seeks servicing data or other useful information.

CONTROLLING FLUID FLOW

MOST of our readers who are concerned with aircraft production and maintenance will be familiar with the Saunders spherical-plug cock, first introduced in 1943-4 for aircraft fuel and oil systems, and later extended in use to low-pressure hydraulics and water-injection, hot-air and other services. It is the makers' claim that the Saunders S.P. cock, and the T.P. cock—the slipper-operated tapered-plug type taken over from Aircraftings, Ltd., in 1949—now satisfy about 95 per cent of the industry's requirements in this field. During 1949 a demand arose for British replacements of American pipe valves, and the Saunders Valve Co., Ltd., accordingly developed a range of gate valves of from ⅜in to 4in diameter. It is stated that these valves are now undergoing type tests and that approval is understood to be imminent.

These valves are not reproductions of American types, but incorporate patented features comparable with those found in the makers' S.P. cock, and will be interchangeable with the S.P. Mk. 2 now going into production. They can be supplied to replace U.S. types and with a range of standardized connections for British pipework. The first electrically operated models will have standard actuators to ensure immediate availability, but subsequent models will be motorized through a rather unusual mechanism claimed to combine great reliability and high efficiency.



The new Saunders motorized gate-valve and (below) the MR. 2 spherical-plug cock.

The makers—the Saunders Valve Co., Ltd., Cwmbran, Newport, Mon.—emphasize that the new gate valves will not in any way supplant the spherical-plug range, but will supplement it and provide facilities for replacement of American cocks.

A note on the Mk. 2 spherical plug cock may also be of interest. It follows the ingenious basic design in which the bored spherical member seats against spring-loaded sealing rings and is rotated by a spindle sealed not by a conventional gland but by a flexible composition sleeve bonded at one end to the spindle and sealed at the other by a retaining ring.

Principal improvements in the Mk. 2 include attachment-flanges which offer greater variety of fitting methods, and the original squared-end operating-spindle is replaced by a serrated shaft having a master-spline to prevent incorrect register with the control sleeve. An unrestricted flow through the full pipeline diameter is given. Motorized versions of the Mk. 2 embrace a range of five actuators with operating speeds of from 1 to 7½ sec. Pipeline diameters of from ⅜in to 1¼in are catered for; the 2in model is now included in the large-bore series, in which there are 2½in, 3in and 4in sizes.

BOOKS RECEIVED

Science News, 16. Penguin Books, Harmondsworth, Middx. Price 1s 6d.

Interplanetary Flight, by A. C. Clarke. Temple Press, Ltd., Bowling Green Lane, London, E.C.1. Price 8s 6d.

Aeronautical Papers of Albert F. Zahm (1885-1945) Vol. II. The University of Notre Dame, Notre Dame, Indiana.

Belgium and Luxembourg Guide and Quiz. Belux Publications, 44, Suffolk Road, Ilford, Essex. Price 3s.

Short Stories, by W. E. Johns. Latimer House, Ltd., 33, Ludgate Hill, London, E.C.4. Price 7s 6d.

Atomics, by Eidinoff and Ruchlis. George G. Harrap and Co., Ltd., 182, High Holborn, London, W.C.1. Price 10s 6d.

Gulf Oil. Gulf Oil Corporation, Pittsburgh, Pennsylvania.

Modern Aircraft Design, by J. L. Nayler. Temple Press, Ltd., Bowling Green Lane, London, E.C.1. Price 8s 6d.

Thermodynamik, by E. Schmidt. Springer-Verlag, Reichpietschufer 20, Berlin W. 35.

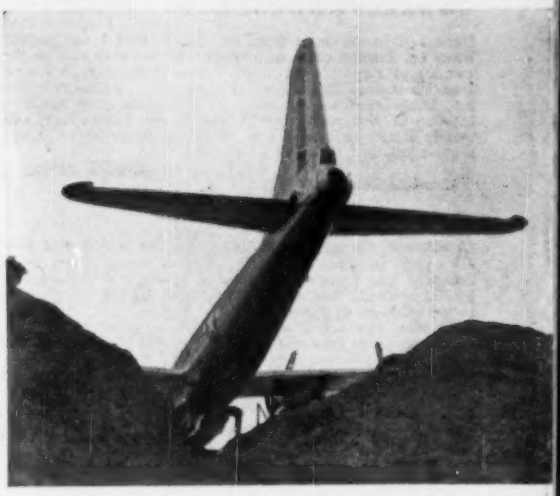
FORTHCOMING EVENTS

Aug.	19.	Swansea and District Flying Club: Kemdey Trophy Race (International), Fairwood Common, Swansea.
Aug.	20.	Skegness Air Rally, Ingoldmells.
Aug.	26.	Wiltshire Flying Club: Thruxton Races.
Sept.	2.	International Contest for Free Balloons, Holland.
Sept.	2.	Coventry Aero Club: Siddeley Challenge Trophy Race, Baginton, Coventry.
Sept.	3-10.	S.B.A.C. Flying Display and Exhibition.
Sept.	8-11.	Biarritz International Rally.
Sept.	15.	Battle of Britain Day.
Sept.	15.	R.A.F.: "At Home" Day.
Sept.	16.	Daily Express International Air Race, Hurn Airport, Bournemouth.
Sept.	17.	Air League (Portsmouth Branch): Air Display.
Sept.	19.	Aero Golfing Society: Autumn Meeting (Cotton Cup), Sudbrook Park.
Sept.	23.	Unveiling of Air Transport Auxiliary Plaque in St. Paul's Cathedral.
Sept.	24.	Association of British Aero Clubs and Centres: Summer Convention, White Waltham.
Oct.	6.	R.A.F. Golfing Society: Match v. Ministry of Supply.

THE VERSATILE B-29

Some Variants of the Famous Boeing Bomber Used for Research and Special Duties

By MAURICE F. ALLWARD



Test-running a General Electric turbojet, suspended from the XB-29G research version on a retractable cradle.

BOEING B-29 Superfortresses were rapidly becoming the backbone of the U.S.A.A.F. during the war and, in the Far East, took the major part in the air war against Japan, dropping 171,000 out of the total of 178,000 tons of bombs delivered on the Japanese homeland. Since the war, the B-29s have not only been the "straight left" of America's operational air force but "cocooned" in many hundreds, have also been her strategical reserve. And with the R.A.F. receiving 70 of them under the American Military Aid Programme, they will form an integral part of our own bomber force. R.A.F. B-29s are known as Washingtons.

With such an impressive record, it is not surprising that the B-29 has, like the Lancaster, been extensively used for experimental work. As in the case of the Lancaster, also, much of this work has been connected with the development of engines, particularly turbojets.

The Superfortress XB-29G is one of several "flying laboratories" operated by General Electric as part of their jet development programme for the U.S.A.F. As can be seen from the illustration of the aircraft backed up over a ground-test pit, the engine under investigation is mounted on a retractable cradle under the rear bomb-bay. A very complete set of test equipment is installed in the fuselage and allows the performance characteristics to be recorded over a wide range of speeds and altitudes.

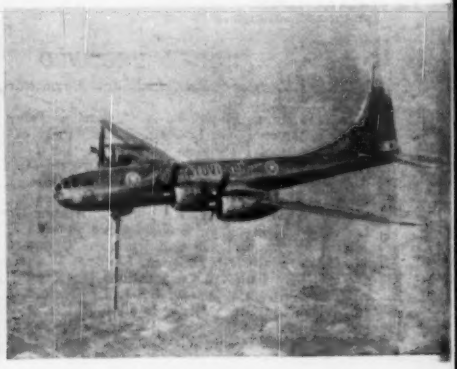
One Superfortress was modified to take four 3,000 h.p. Allison V-3420-A16 liquid-cooled engines and designated the XB-39. The allocation of an official Air Force bomber type number indicated the intention of producing a version powered by these engines had the tests proved entirely successful, but as it was, only the one prototype was built. The extra 2,000 h.p. of the four Allisons resulted in a quite remarkable performance, the take-off being particularly improved.

As in Great Britain, considerable interest is being shown in the United States towards the possibilities of flight refuelling. One system, known as the flying boom method, has been specifically developed for refuelling B-29s and B-50s by Boeings as part of their current development programme for the U.S.A.F. A rigid telescopic fuel boom extends from under the B-29 tanker's tail and is controlled by an operator working vee-shaped "ruddervators," which, reacting to the airflow, guide the boom up or down or from side to side. The operator's job is to extend the boom and then guide it into the special socket in the top of the receiver's fuselage, forward of the upper turret.

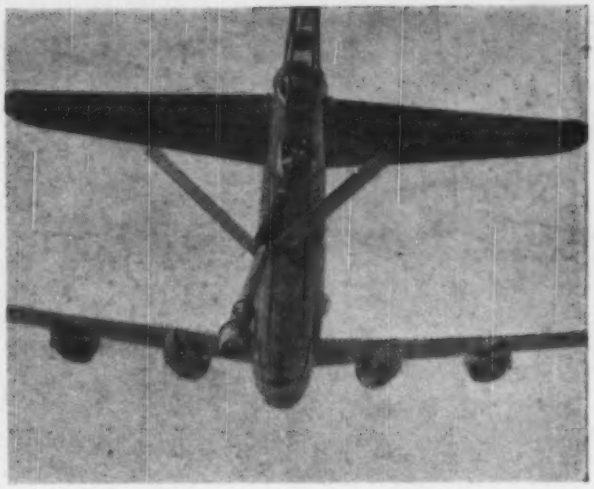
This method is claimed to alleviate some of the difficulties

Experimental Superforts have "air-lifted" both the supersonic Bell X-1 and the XF-85 McDonnell Goblin "parasite" fighter, seen below in the act of detaching. The latter project has now been abandoned.

Equipped for relaying TV programmes, the "Stratovision" B-29 carries a large, retractable transmitting antenna and receiving aerial.



The XB-39, one of the most powerful Superforts, had Allison 3,000 h.p. in-line engines.



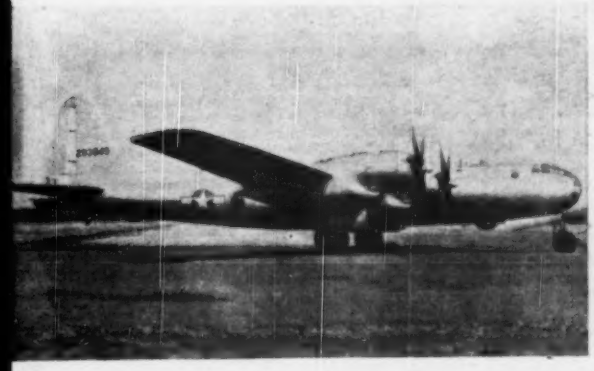
Dramatic close-up of a B-29 equipped for "flying boom" refuelling. At present, however, the U.S.A.F. employs the British flexible-hose system.

experienced with the use of a flexible hose and to enable refuelling to take place quicker and at higher altitudes than was possible with existing methods. Considerably more skill, however, would appear to be required during the operation, particularly once the connection has been made, when highly accurate flying is necessary. The large mass of the rigid boom would also be dangerous in gusty conditions and seems particularly liable to foul the airscrews of the receiving aircraft. Boeing have received a U.S.A.F. order for 116 boom-equipped B-29 tankers.

Most impressive is the "Stratovision" B-29, used for experiments in relaying television programmes. The advantage of using aircraft for this work is that at 30,000ft more than eight times the area served by a ground station can be covered, using only a fraction of the power. A B-29 was chosen because, being pressurized and able to cruise at high altitudes, it was the most suitable aircraft then available. The receiving aerials, for both sound and vision, are mounted above the fin and the 25ft transmitting antenna is hinged under the fuselage and retracts flush when not in use. The drag of this mast when lowered at the normal cruising speed is 350 lb, but fortunately the large nose-down moment is largely counterbalanced by the drag of the receiving aerials. The first public demonstration was made in June, 1948, and a programme relayed over 100 miles, but no announcement has since been made that indicates whether the scheme is an economic proposition.

Early flight trials of the McDonnell XF-85 Goblin "parasite" fighter were carried out with the aid of a B-29, to which a replica of the B-36 retrieving cradle was fitted. The fighter was hooked on before take-off and released at operational altitude. The little aircraft handled satisfactorily in the air but great difficulty was experienced when attempts at re-engagement were made, and several times the fighter had to be landed on the ground—at about 170 m.p.h.! The whole project has now been abandoned.

Designated XB-44, this version was powered by 3,500 h.p. Pratt and Whitney Wasp Major engines: it served as a prototype for the higher performance B-50 series.



Specialized Duties

In addition to these research B-29s, numerous variants have been developed for specialized duties with the Air Force. Typical of these are the F-13s, developed for long-range, high-altitude photographic reconnaissance; they did some of the aerial mapping of Japan before her surrender, and a sub-variant, the F-13A, was used as camera recording and observation aircraft during the Bikini atomic-bomb experiment. During the war a number of B-29s were stripped down and all armament except the tail guns removed, then they were used for extreme-high-altitude bombing missions over Japan. It was one of these, the B-29B *Pacusan Dreamboat*, which, fitted with extra fuel tanks, set up the former world's long-distance record of 8,198 miles in 1945.

The Air Weather Service, a division of the M.A.T.S., uses B-29s for air-rescue work, and RB-29s for weather reconnaissance duties. A few B-29s are in service with the U.S. Navy in anti-submarine experiments and, when so used, are known as P2B-1s.

The B-29 as a bomber has also been undergoing steady development since the war. During 1949 large numbers of those "cocooned" after the war were modernized by Boeings at the Air Force plant in Wichita, Kansas. Principal changes include improved electronic equipment, addition of fuel injection to those engines not so equipped, addition of pneumatic bomb-bay doors, and modification for flight refuelling.

Further improvements, including the fitting of the more powerful Pratt and Whitney 2,650 h.p. Wasp Major engines, resulted first in the "prototype" XB-44 and later the fully fledged B-50 development of the Superfortress.

CIVIL AVIATION NEWS

TEEING UP FOR FARNBOROUGH: Since making its first flight in May the D.H. Heron 12-16 seat feederliner has already achieved a total of 70 hours' test flying. The prototype is due to appear in the S.B.A.C. Show at Farnborough from September 6th to 10th.

RECOGNITION AT LAST

SPEAKING at the Roborough Air Display at Plymouth on August 12th, the Secretary of State for Air, Mr. Arthur Henderson, referred to the use by the R.A.F., for the first time, of the resources of private charter companies for the movement of whole units by air over short distances. Mr. Henderson said that charter aircraft were now carrying Royal Auxiliary Air Force squadrons and other units to their training camps in different parts of this country and in Germany and he hoped that the scheme would eventually have a much wider application. The scheme was introduced a short time ago and is being used to supplement the R.A.F.'s own transport facilities which, because of the need to concentrate on building up striking power, have recently been reduced.

It is now not always possible for the R.A.F. to spare aircraft and crews to give units experience in the air-movement technique. In this respect charter companies can be of great assistance, particularly in transporting passengers and light equipment over short distances, when the use of Service aircraft would be uneconomical. Another important consideration is that Transport Command's long-range heavy aircraft are often unable to operate from the small airfields on which many units are based. The scheme thus has dual advantages, for not only is the arrangement particularly convenient to the R.A.F., but, by virtue of this co-operation with the Service, the charter companies themselves automatically form a valuable reserve of aircraft and air crews readily adaptable to military operations should the need arise.

Bristol Freighters and Vikings were recently used to carry the personnel and equipment of a R.Aux.A.F. squadron to its annual summer camp. The Air Ministry states that it is hoped to make increasing use of the charter companies' facilities to provide an air lift for all kinds of R.A.F. units, both auxiliary and regular, during exercises and training moves.

In our view, it is encouraging to see that the value of the charter companies—so often emphasized in these pages—has at last been fully appreciated by the Government and it is to be hoped that the promised expansion of the scheme will be extensive. Such a move will ensure not only that a minimum number of aircrews and aircraft are maintained at a high standard of efficiency during the present threat of war, but will also improve the companies' financial situation and permit expansion of civil operations when more settled conditions follow.

SEALAND SITUATION

THE recent cancellation of the order for a number of Short Sealands, for use on the Caribbean routes of British West Indian Airways, has naturally led to some speculation as to the general suitability of the aircraft for scheduled operations of this nature. Within the limitations of its size, the Sealand is known to have particularly good characteristics in comparatively rough-water conditions and, in order that there should be no misunderstanding of the reasons for the withdrawal of the type from service in the West Indies, Short Brothers and Harland, Ltd., have issued a statement detailing the circumstances in which the cancellation was brought about. It reads:—

"After successfully completing trials in the West Indies for the grant of a British C. of A. covering 'intercontinental maximum' conditions, a demonstration Sealand, piloted by the company's chief test pilot, Mr. T. W. Brooke-Smith, made a survey flight along the route on which it had been proposed to operate a scheduled service. Mr. Brooke-Smith felt it necessary to report that St. Vincent and Dominica—where it had been intended, in the absence of any airfields, to operate from the sea—had no landing area at all suitable for operation of a flying-boat (or amphibian) of comparable or even much greater size than the Sealand, except as a special operation in selected weather conditions.

"In these circumstances it was mutually agreed between B.O.A.C. and Short Brothers and Harland that it would not be in the best interests of British aviation to put the aircraft into service on this route."

The Sealand used on these trials will shortly begin a demonstration tour throughout the north of the South American continent. A number of Government departments and commercial operators are known to be interested.

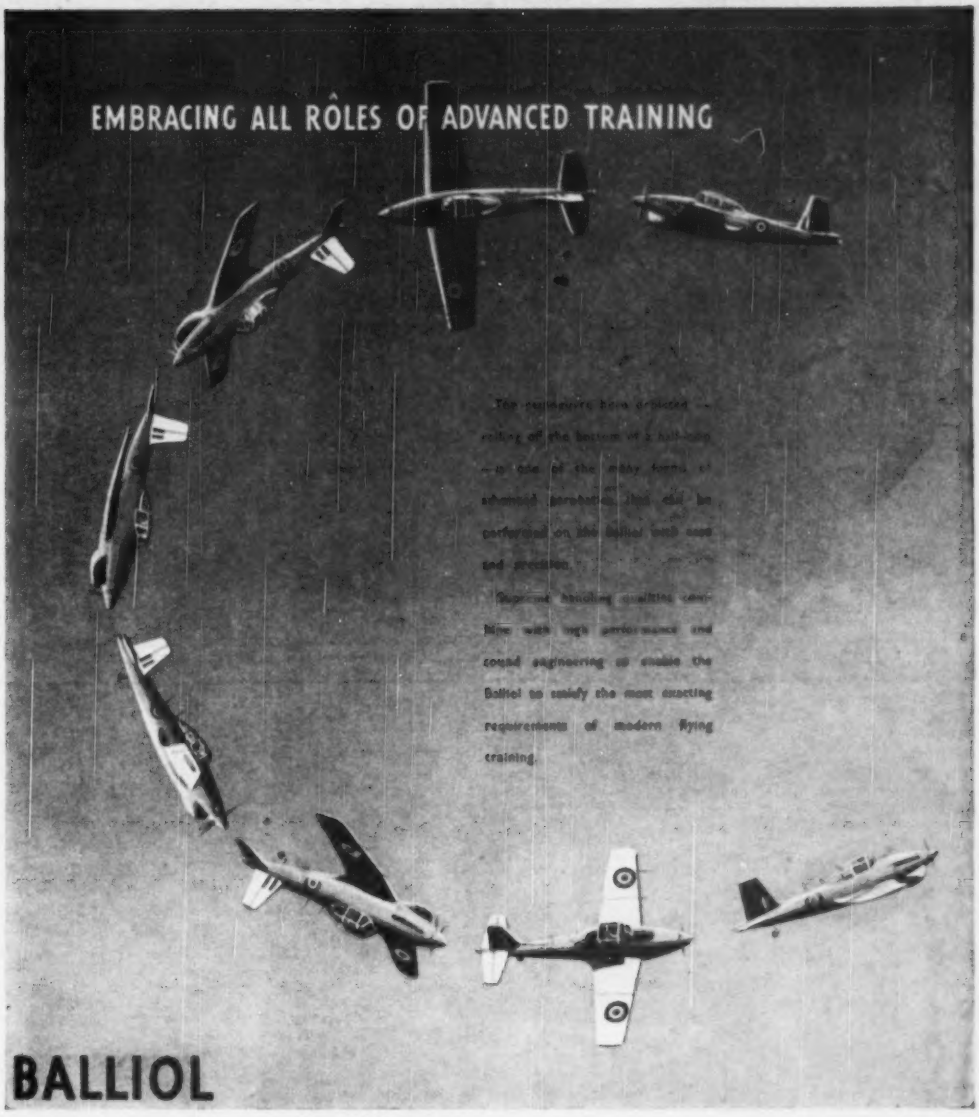
ZERO READER IN SERVICE

THE C.A.A. has granted operational approval for the use of a Sperry Zero Reader installation in a K.L.M. Constellation. This is the first time the instrument has been put into service with a scheduled airline, and it occurs at a time when a number of other companies are still conducting trials to evaluate the device. (As mentioned in *Flight* of August 3rd, B.O.A.C. has placed an order for similar equipment with the Sperry Gyroscope Co., Ltd., England. It is to be fitted in the D.H. Comet and is expected to be in service by early 1951.)

The Zero Reader (which was described fully in *Flight* of August 18th, 1949) is a gyroscopic instrument which enables a pilot to fly and navigate an aircraft manually with a degree of accuracy approaching that of automatic control. On the face of a simple two-element indicator, it collates information usually provided separately by the gyro horizon, directional gyro, magnetic compass, sensitive altimeter and I.L.S. cross-pointer meter. Its use in connection with I.L.S. technique should permit regular operation in conditions of low ceiling and poor visibility, eliminating the need for frequent overshoots.

FACILITATING ENGINE MAINTENANCE

TO simplify some of the maintenance problems on the DC-6s used by the company, K.L.M. engineers have designed an interesting engine test trolley. By simulating certain functions of the engine in the full-throttle running condition the device



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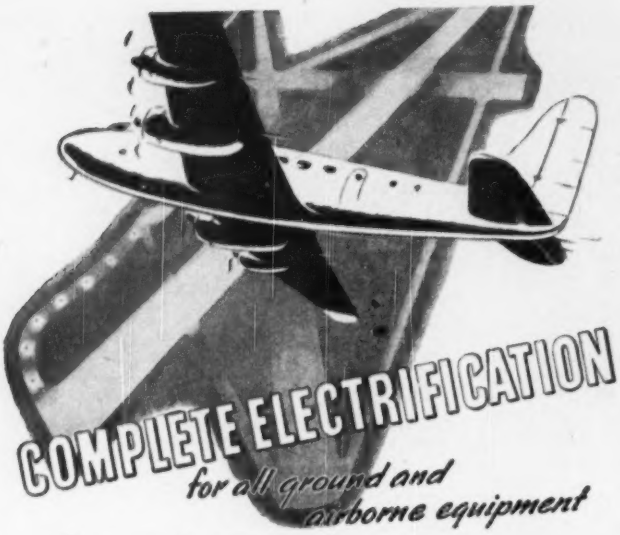

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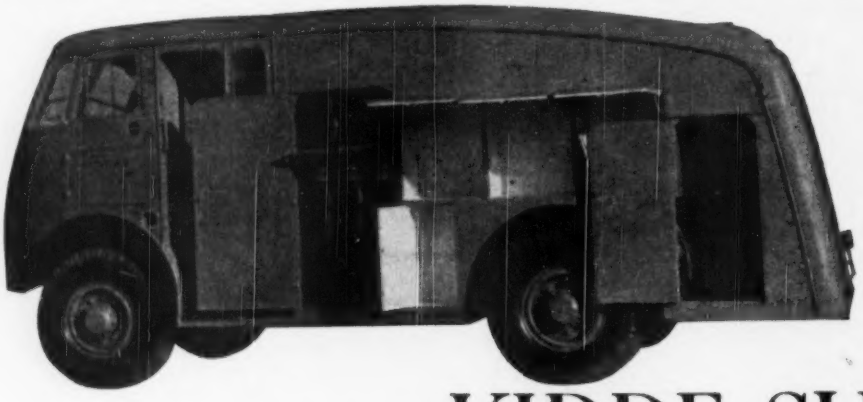

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CRASH TENDER

The SUN air foam pump, mounted on a Thornycroft all-wheel drive chassis, will deliver 2,500 g.p.m. of foam—total 4,500 gallons of foam. The KIDDE CO_2 equipment will discharge 500 lbs. of CO_2 per minute—total 900 lbs. CO_2.

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SUN ENGINEERING *(RICHMOND)* **LTD.** KINGSTON-ON-THAMES.
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CIVIL AVIATION NEWS

effects considerable savings in man-hours, fuel, and engine wear and tear. Replacing the operating control mechanisms in the cockpit, the unit enables each engine to be ground-tested before installation in the aircraft. In addition to replacing the cockpit control mechanism, the apparatus also replaces the aircraft's own electricity supply.

The following systems can be checked: oil-cooler door; cowl flaps, tachometer and airscrew synchronization; primer solenoid; oil dilution valve; blower actuator; thermocouples; pressure indication and warning; fuel-flow indicator; oil quantity gauge; fire detectors; the electrical part of the airscrew control; b.m.e.p. transmitter; vacuum system; static system; and manifold pressure system.

The unit is fully mobile and consists of an instrument panel containing control and indication sections. The latter comprises a series of warning lights, which mainly serve to check whether a component, either of the unit itself or of the engine under test, is energized or not. In the control section are found the circuit-breaker switches; potentiometer; push buttons; fuses; and two terminals to provide current for electric tools. Auxiliary components are checked by various methods, in which use is made of electrical potentiometers, suction, compressed air, heat (for the fire detectors) and oil pressure.

One of the main advantages of using such a device is that if any components are not functioning correctly they can be detected and adjusted before the engine is installed in the aircraft, thus reducing the risk of time-wastage in redismantling the unit.

ROTARY POST: In conjunction with the Belgian postal authorities Sabena started the first Continental helicopter mail service yesterday, August 16th. One of the two Bell 47-Ds being used for the purpose is shown here at Melsbroek airport, Brussels.

BREVITIES

PERMISSION has been refused for Pan-American Airways to operate a service within the United States. The company's application to the C.A.B. had been pending since March, 1945. The routes in question would have connected cities now served by P.A.A. as terminal points on their international services.

* * *

The Martin 2-0-2A twin-engined transport has been certified by the C.A.A. for a gross take-off weight of 43,000 lb, the greatest ever granted to twin-engined commercial aircraft. The original 2-0-2 was authorized for an all-up weight of 39,900 lb.

* * *

Traffic transactions registered by the I.A.T.A. Clearing House in London during June reached the record figure of $13,745,000. The total for the first six months of the year, $81,900,000, is also higher than any previous figures.

* * *

In preparation for regular services from Quito Equador, to points in North America, Panagra recently completed take-off tests with DC-4s fitted with Jato units.

* * *

A record average of 24 cars is now being flown daily on the Silver City car ferry from Lympne to Le Touquet. On several occasions the Freighters, which are flying a total of 14 hours a day, have carried the maximum possible number of 26.

* * *

T.E.A. is to begin a new Solent flying-boat service from Wellington to Rose Bay, Sydney, in the first week of October. Initial frequency will be twice weekly, and only a minimum number of passengers will be carried until the facilities at the Evans Bay, Wellington, landing point are improved.

* * *

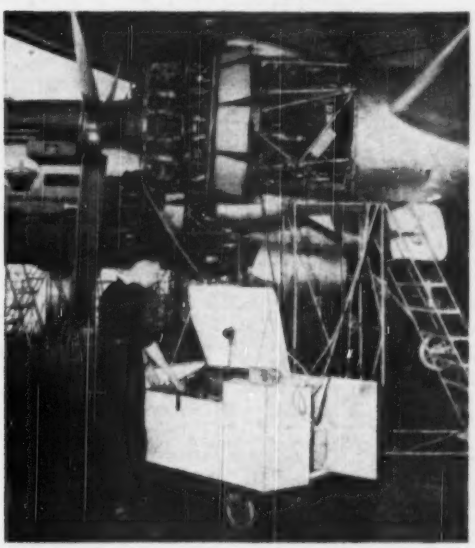
Following recent authorization by the C.A.B. and President Truman, United Air Lines announce plans to inaugurate direct Stratocruiser flights between Los Angeles and Honolulu early in October. This 2,558-mile addition to the existing 10,700-mile network will enable United to provide a one-carrier service between Hawaii and 78 cities in the United States.

* * *

The accident rate for private aircraft in South Africa, as indicated by the figures for the last two years, is said to be causing great concern. Figures for 1949 show that one accident occurred in every 220 hours' flying by private pilots, as compared with one every 40,864 hours in scheduled airline operations.

* * *

It is reported from Australia that Captain P. G. Taylor, G.M., a former associate of the late Sir Charles Kingsford-Smith and, incidentally, the pilot responsible for surveying the air route to South Africa *via* the Cocos Islands, is to undertake a survey flight by Catalina from Australia to Chile across the South Pacific. Capt. Taylor has for some years been attempting to obtain permission and financial assistance to make this flight. The Australian Minister for Air decided to



ENGINE SIMULATOR: The test rig designed by K.L.M. engineers for testing DC-6 engines before installation (see pages 204-205) is seen to be a compact and easily movable unit.

CIVIL AVIATION NEWS . . .

sponsor the scheme, which will be carried out with an R.A.A.F. machine as soon as the necessary arrangements can be made.

* * *

The first all-British airliner to go into service with B.O.A.C. since the end of World War II completed its first commercial round trip when it landed at London Airport on August 10th after a 7,500-mile flight to West Africa and return. The aircraft was *Hengist*, one of the fleet of 25 Hermes IVs now being delivered to the Corporation.

* * *

A P.A.A. Stratocruiser landed at the Rhein-Main air base last Thursday with what is believed to be a record transatlantic passenger load. The total of 103 persons aboard included 44 children, 31 of whom were under seven years of age. The aircraft had been chartered by the U.S. Army for a flight from New York to Frankfurt *via* London Airport.

* * *

A progress report issued by the B.O.A.C. sales office in New York indicates that June (with a total of more than one million dollars) was the best dollar-earning month which the airline has yet enjoyed. For the first six months of the current year dollar earnings amounted to just under two million dollars, as compared with one-and-a-half million for the corresponding period of 1949.

* * *

As forecast in *Flight* last week, the prototype Vickers Viscount has now been transferred from B.E.A.'s London-Paris service to the London-Edinburgh route, to help carry the large numbers of tourists now visiting the Edinburgh Festival. It is scheduled to fly both normal and extra services on this route until August 22nd, when it will be taken out of commercial operation and used for crew-training purposes.

Mr. J. A. W. Brooker, M.B.E., has been appointed to succeed Mr. A. P. L. Sullivan, C.B.E., M.M., as Chief Fire Service Officer of the Ministry of Civil Aviation.

* * *

Sabena are now offering a special 23-day return fare of £39 4s on their London-Milan route, representing a saving of £8 12s on the normal return fare.

* * *

G.A.P.A.N. announces the resignation of Mr. I. L. S. McNicol who, for the past five years, has been the Association's secretary-general. His place will be taken by Major J. L. B. H. Cordes, who for over three years has been secretary to the Guild's test pilots' section and in charge of the employment advice bureau.

* * *

Swissair will celebrate its twentieth anniversary next year. The growth of the company's operations is emphasized by the fact that unduplicated route mileage now amounts to some 21,870 as compared with 2,735 in the year of its foundation, 1931.

* * *

Following the announcement that Renfrew is to remain the permanent airport for Glasgow, the chairman of the Scottish Advisory Council, Sir Patrick Dollan, states that a new £150,000 terminal building is being planned. It will be designed on the assumption that by 1960 the airport will be handling 500,000 passengers a year.

* * *

Air France reports that the first production model of the S.E.2010 will be ready for proving trials this month; the company has ordered 15 for its transatlantic services. The Breguet 761-3 Deux-Ponts, with an a.u.w. now increased to 48 metric tons, is also nearing the end of its flight-testing programme. A number of these aircraft have been ordered by Air France for services to North Africa.

FROM THE CLUBS

SPANISH TOURIST: A new product of the Spanish Iberavia Company is this interesting two-seat light sporting aircraft, which was first presented at a recent aeronautical exhibition in Madrid. Basically a low-wing cantilever monoplane of all-wood construction, it bears some resemblance to the Ryan Navion. The tricycle undercarriage is fixed; a maximum speed of 122 m.p.h. is claimed.

A PERFECT summer afternoon brought large crowds to the Cowes Air Display on Sunday, August 6th. In addition to the participating aircraft, there were no fewer than 45 visiting machines from clubs on the mainland. The programme followed the popular lines of past shows, opening with a polished sailplane display by F/Lt. W. L. Jennings in an Eon Olympia. This was followed by Tiger aerobatics ably performed by Mr. Paddy Newton.

One of the best-known civilian aerobatic pilots, Mr. C. Nepean Bishop, performed in five items during the afternoon. In addition to balloon-bursting and height judging, he gave a display of completely unairmanlike flying with his version of "first solo," while subsequent aerobatics included a perfectly executed hesitation roll and the even more difficult inverted turn.

A particularly colourful item was the performance of one Colonel Crackshott who, suitably bearded and cloaked, stood in the rear cockpit of a low-flying Tiger, firing a revolver with remarkable "accuracy" at a row of suspended bottles. Other items included demonstrations of types and model aircraft displays.

The arrival competition was won by Mr. Bishop, the *concours d'élégance* by Mr. W. S. Twitchell in a Proctor, and the prize for the oldest aircraft by Mr. O. V. Holmes.

* * *

CLUB flying-time for July at the Strathtay Aero Club represented a considerable decrease in comparison with the hours flown in June. In the early part of the month the weather was partly responsible, while in the latter fortnight impending C.s of A. caused several aircraft to be grounded. In addition, another Tiger Moth was off duty being prepared for the Grosvenor Challenge Trophy Race in which, piloted by R. J. D. Hamilton, it put up a creditable performance in gaining eighth place.

The A.T.C. Flying Scholarship Scheme began on July 1st and seven cadets are now undergoing flying instruction. The first of these pupils was sent solo after only 6 hr 15 min dual and, later in the month, two more also reached the first solo stage.

* * *

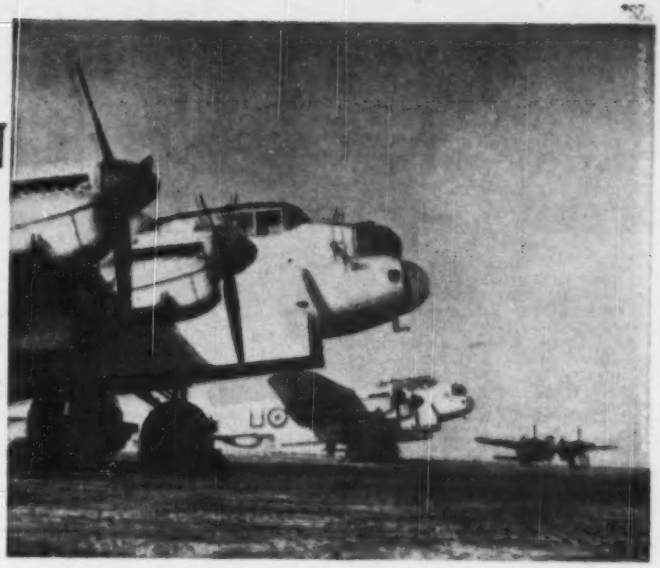
AUSTER AIRCRAFT, LTD., announce that, due to circumstances beyond their control, they have been forced to cancel the Air Rally planned for August 19th at Rearsby.

* * *

THE A.B.A.C. states that, as a mark of regard for the Royal Aero Club, and in order that none of its functions should coincide with a R.Ae.C. event, the Council of the Association has decided to defer the A.B.A.C. Summer Convention originally arranged for Saturday, August 19th (the day of the Kemsley Trophy Race) until Sunday, September 24th. The convention will take place at White Waltham airfield, starting at 11 a.m. There will be an arrival competition for visitors both by air and by road. The Association hopes that the Convention will provide an opportunity of terminating the present summer season with a friendly gathering for all club members and those interested in the club flying movement. Admission will be free, but a buffet luncheon will be available at a cost of 3s 6d per person.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements



MARITIME TYPES : Lancasters from a Malta-based reconnaissance squadron and two Naval Mosquitoes (one a target-towing Mk. 39) are seen at El Adem during the recent Anglo-American fleet exercise *Highway Two*. The object of the exercise was to move a convoy from Alexandria to Malta in the face of sea and air attacks. Fireflies and R.A.F. Vampires (from the Canal Zone) took part in addition to the types shown.

Atlantic Treaty Training

STUDENT pilots from France, Belgium, the Netherlands, Norway and Italy reported to R.C.A.F. Station, London, Ontario, on August 1st for a six-week pre-flight course. Later, about fifty student pilots and an equal number of navigation trainees will be given basic instruction by the R.C.A.F. The basic courses will last 37 weeks; pilots will train on Harvards at Centralia and the navigators at Summerside.

Canada is providing the instruction, under the terms of the North Atlantic Treaty, as a concrete means of assisting in the military training programmes of the signatory nations and of familiarizing the officers of each with members of other countries' forces. If arrangements can be completed in time, Portugal may be represented in the scheme, as well as the other nations listed. All training expenses are borne by Canada, other than the cost of pay and allowances, clothing, transport to and from Canada and personal expenses.

Anglo-French A.A.

DURING the Western Union air exercise, code-named *Cupola*, and to be held from August 25th-27th, a British A.A. fire command troop will man an anti-aircraft operations room in Paris. The ops. room will be linked to a French operations centre and half the British troop's members will be French-speaking, as all the "telling" will be in French.

Most of the A.A. troop will be accommodated in a Paris barracks, which will fly the Union Jack alongside the Tricolour. A recent Western Union agreement makes it unnecessary for military personnel to carry passports; they only require a movement order in French and English.

A STATESMAN LOOKS IN : Mr. Winston Churchill shows interest in a Meteor 7 of No. 615 (County of Surrey) Squadron at Biggin Hill shortly before taking off for Strasbourg in a chartered Dakota of Silver City Airways. His escort is S/L. Peter Devitt, C.O. of No. 615 Squadron, of which Mr. Churchill is Honorary Air Commodore. Two "615" Spitfires escorted his Dakota to the coast.

R.A.F. Appointments

AIR COMMODORE L. TAYLOR, who has been Director of Movements at the Air Ministry since January, 1948, will shortly take up a new appointment as S.A.S.O. at H.Q., No. 40 Group, Maintenance Command. His successor at Air Ministry will be G/C. M. S. Shapcott, who will receive the acting rank of Air Commodore. Since January of last year, G/C. Shapcott has been O.C., No. 16 Maintenance Unit.

R.A.F. Nursing Service

IT is announced that Princess Mary's Royal Air Force Nursing Service shall now form part of the R.A.F., within which it will be a distinct organization on the pattern of the Medical and Dental Branch, retaining its present title.

Swedish Visit

NORTH WEALD, Horsham St. Faith and Waterbeach will be visited by Vampires of the Swedish Air Force in the first week of September. The Swedish squadron is making a courtesy visit at Britain's invitation.

Previous goodwill flights between England and Sweden took place in 1948—when Hornets of 65 Squadron toured Sweden and Swedish Mustangs made a return visit—and last year, when Meteors of 60 and 92 Squadrons flew to Scandinavia.

Battle of Britain Service

A SERVICE of Thanksgiving for the victory achieved in the Battle of Britain will be held in Westminster Abbey on Sunday, September 17th, 1950, at 3 p.m. Applications for tickets for the Service from widows and bereaved parents of Battle of Britain aircrew, from retired R.A.F. officers, and from Battle of Britain pilots, should be sent to Air Ministry (S.4(d)), Whitehall, London,

SERVICE AVIATION . . .

S.W.1, in writing, not later than September 4th. In view of the limited number of seats not more than two tickets can be issued to any applicant. Applications should not be made to the Abbey itself.

Appeal for Jamaica

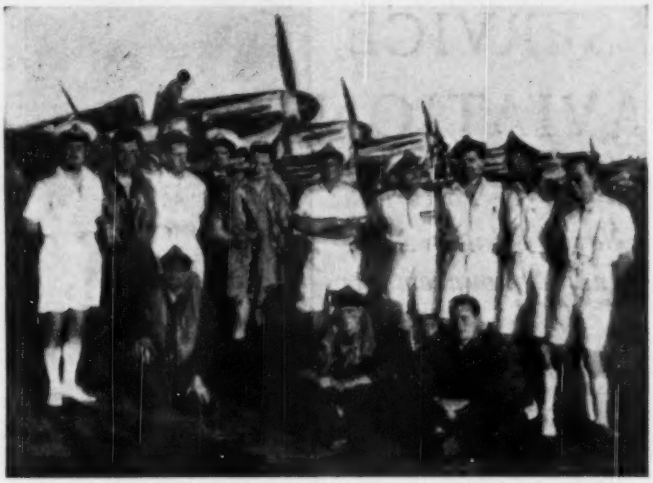
ARISING from the growing unemployment in Jamaica, a special appeal is being made by the Controller of the R.A.F. Benevolent Fund. It is asked that anyone who can spare sports equipment or sports kit should forward it to S/L. J. B. Higham, President, R.A.F. Association, 12, South Camp Road, Kingston, Jamaica, B.W.I. Cricket gear is especially needed.

Air Lift to Tokyo

PHOTOGRAPHS in this issue illustrate the R.C.A.F. transport squadron lent to the United Nations by Canada to assist in the Korean campaign. The Canadian contingent, No. 426 Squadron, consists of six Canadair North Stars, each with two complete crews of four aircrew personnel with two groundcrew serving as flight engineer and cargo superintendent. The Squadron is operating from McCord Field, Tacoma, Washington, under the operational control of United States Military Air Transport Service; normal administrative control of the squadron remains with R.C.A.F. Air Transport Command at Rockcliffe, Ontario.

Supplies are being flown to Tokyo *via* the great circle route over the Aleutians, a distance of about 4,500 miles, calling for approximately 22 hours flying time. In addition, two more North Stars will operate between the Squadron's home base at Dorval and Tacoma, providing logistic support for the operation. At McCord Field there are nearly 200 R.C.A.F. groundcrew, with maintenance equipment to support the air lift.

A small portion of 426 Squadron remains at Dorval to carry on essential re-supply runs to isolated northern bases and to give familiarization training to air crews intended as replacements on the Pacific operation.

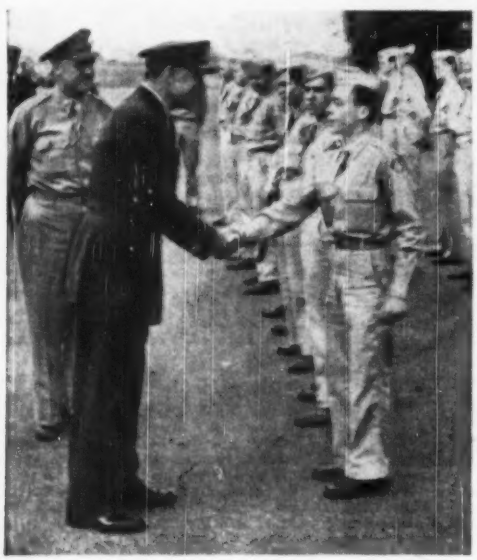


RESERVISTS IN MALTA: With their eight Firefly I anti-submarine aircraft in the background, these No. 1830 (R.N.V.R.) Squadron personnel are seen shortly after arrival at Halfar Naval airfield, Malta, on August 1st. Based normally at Abbotsinch, Scotland, the unit is the first of its kind to undergo its annual training overseas.

Valetta's "Med" Trip

A VICKERS Valetta transport of the R.A.F. Flying College was due to return to Manby on Tuesday from a five-day, 3,350-mile navigational training flight to Castel Benito *via* Istres and Malta, which was intended to exercise staff officers in mobile servicing problems. G/C. E. G. Palmer, O.B.E., who is in charge of administration at the College, was in overall command, and S/L. K. G. Hubbard, D.F.C., captained the Valetta.

Ten groundcrew flew on the trip, including two members of the W.R.A.F.: Cpl. K. R. Wood, who serviced aircraft in Germany during the Air Lift, and Cpl. D. M. Storr, who has worked on maintenance at Manby for nine years. Three A.T.C. cadets were also taken.



THREE-WAY EXCHANGE: Air Marshal Sir Robert Foster, A.O.C.-in-C. Home Command, welcomes the 25 cadets of the American Civil Air Patrol who arrived at Northolt on August 7th. Canadian air cadets are also touring Britain and, in exchange, American and Canadian tours have been organized for 50 cadets of the A.T.C.

Canadian Fighters

AVRO Canada's CF-100 two-seat all-weather fighter, of which the second prototype was recently completed, has been officially named the Canuck. Announcing this, Mr. Claxton, the Canadian Defence Minister, stated that the aircraft was "unquestionably some time in advance of all other aircraft in this particular field."

F/L. Bruce Warren, D.F.C.

To assist in the Canuck flight-test programme, which has so far been undertaken by Gloster chief test pilot S/L. Bill Waterton, F/L. Bruce Warren has been granted two years' leave from the R.C.A.F. F/L. Warren is a graduate of No. 8 Course at the Empire Test Pilot's School, and has 2,200 hr on 28 types to his credit. Recently he has been attached to the R.C.A.F. Winter Experimental Establishment at Edmonton. He has a twin brother in the R.C.A.F. and both Warrens served as flight commanders with 66 Squadron, R.A.F. Fighter Command, during the war; they received the D.F.C. simultaneously.

At Dorval, on August 9th, the first North American F-86 Sabre to be built under licence by Canadair, Ltd., at Montreal, made a successful first flight.

Do you know your airfields?

3

Recognize this airfield? It's No. 3 of this series of puzzle photographs. You'll find the answer below on the right★

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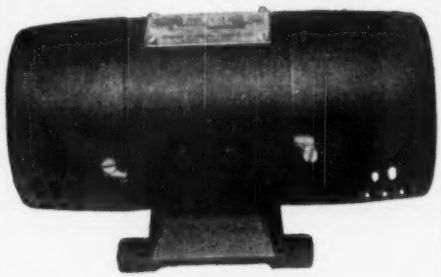

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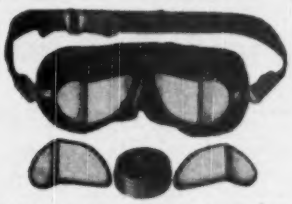

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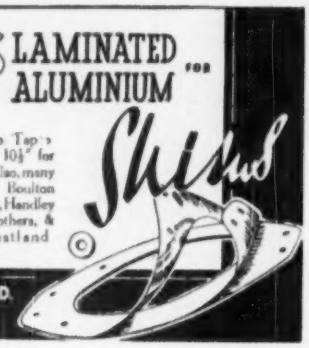

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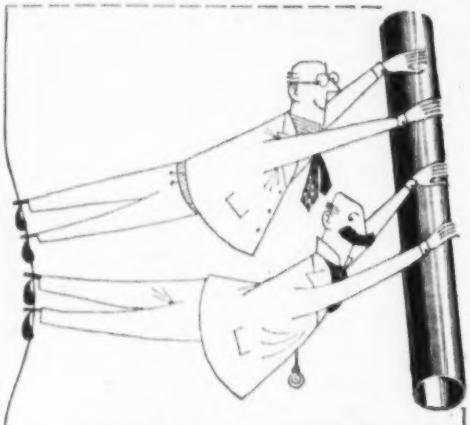

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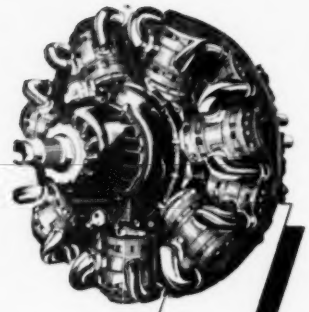

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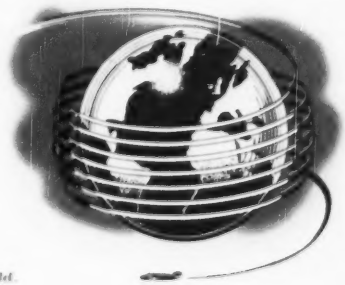

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